The Chemical Age

VOL. LXXVI No. 1951

1 December 1956

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(See page 359)

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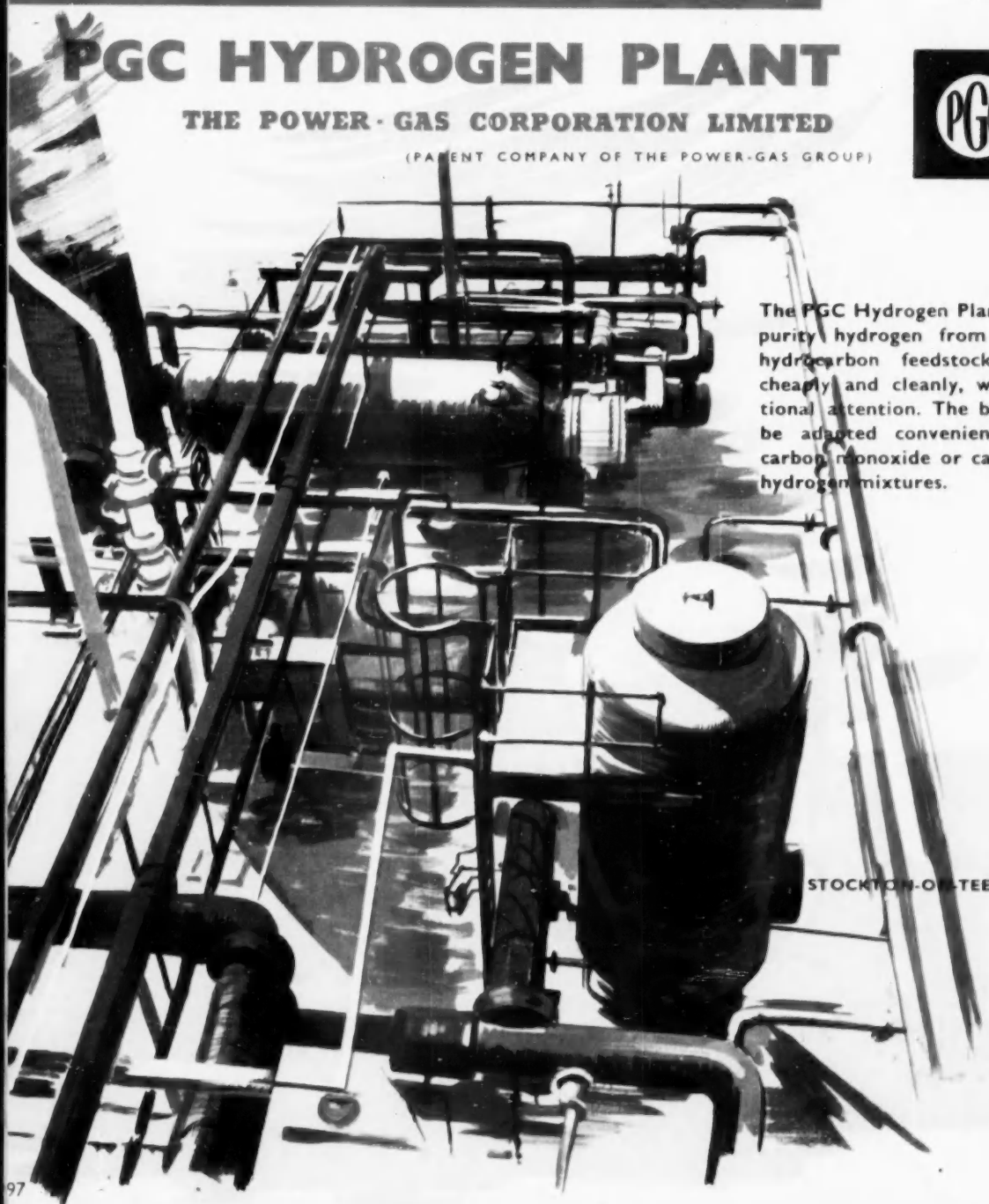

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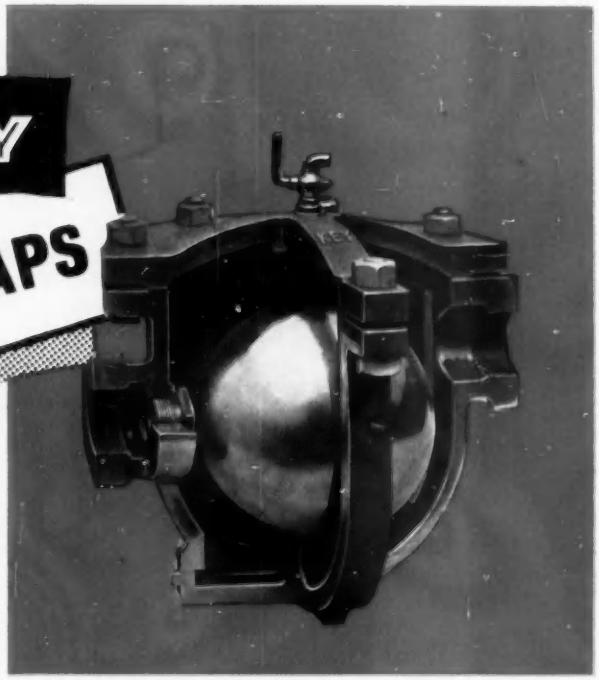

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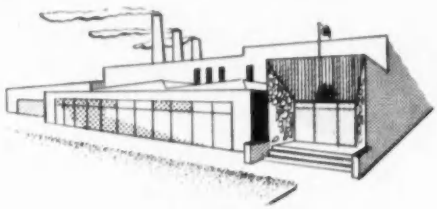

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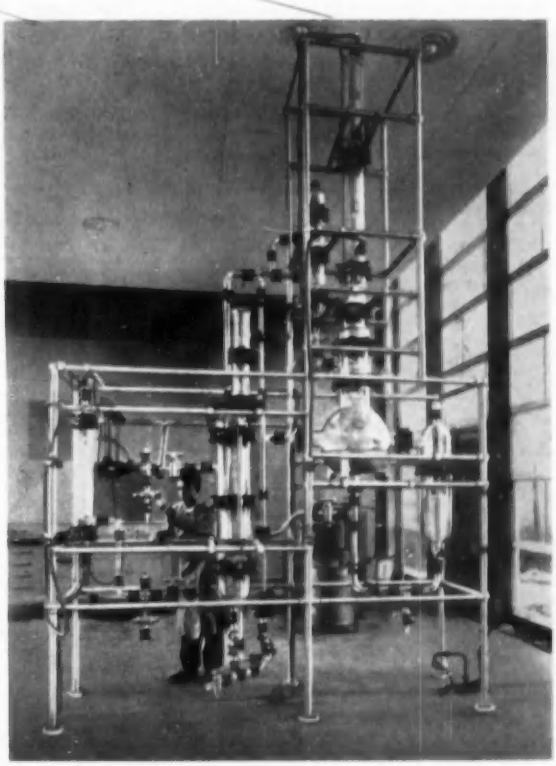

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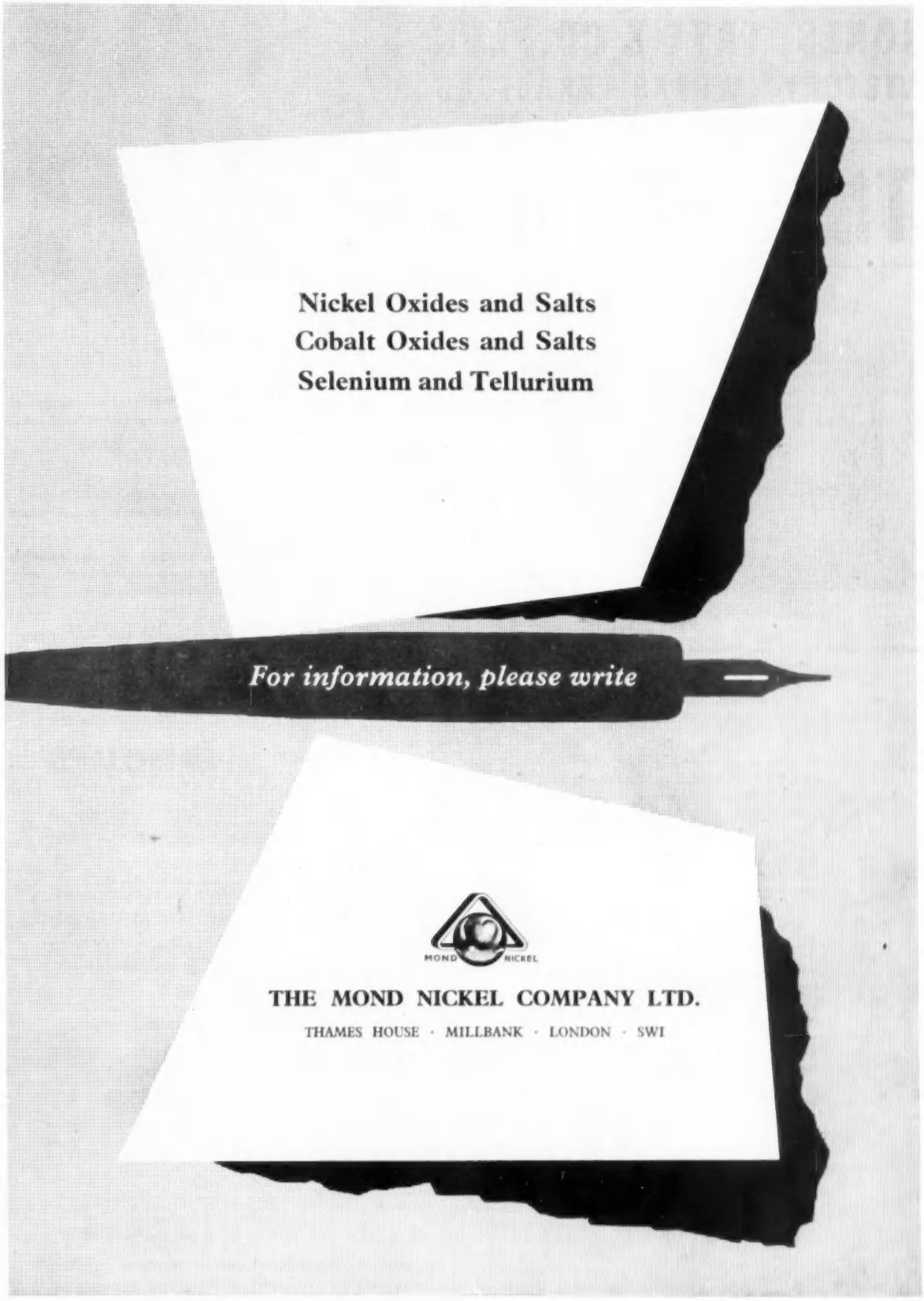
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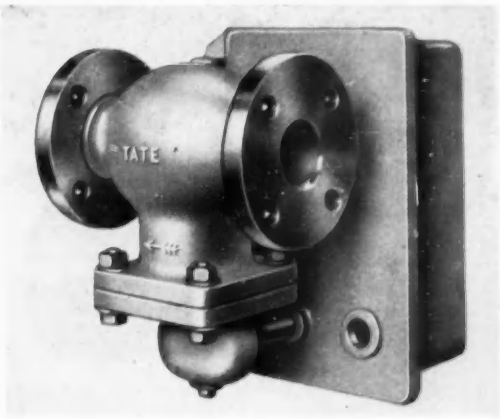

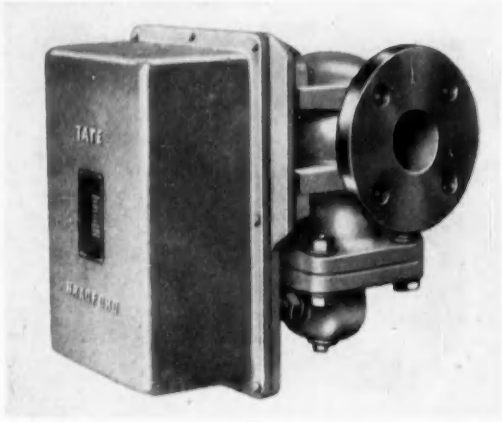

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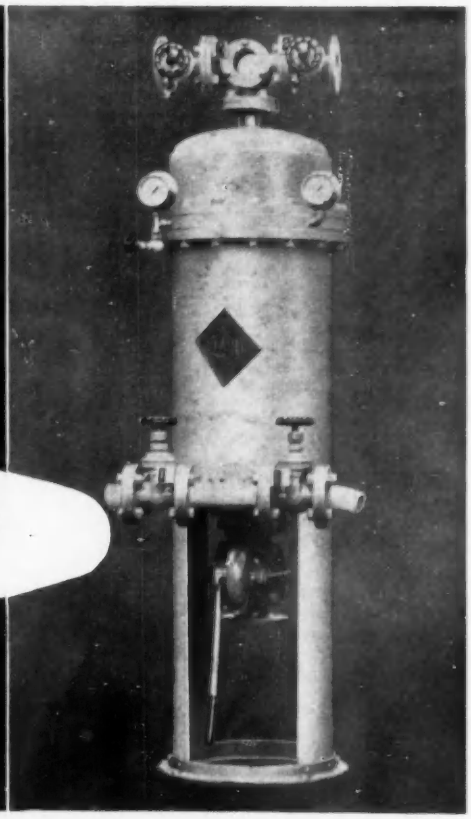

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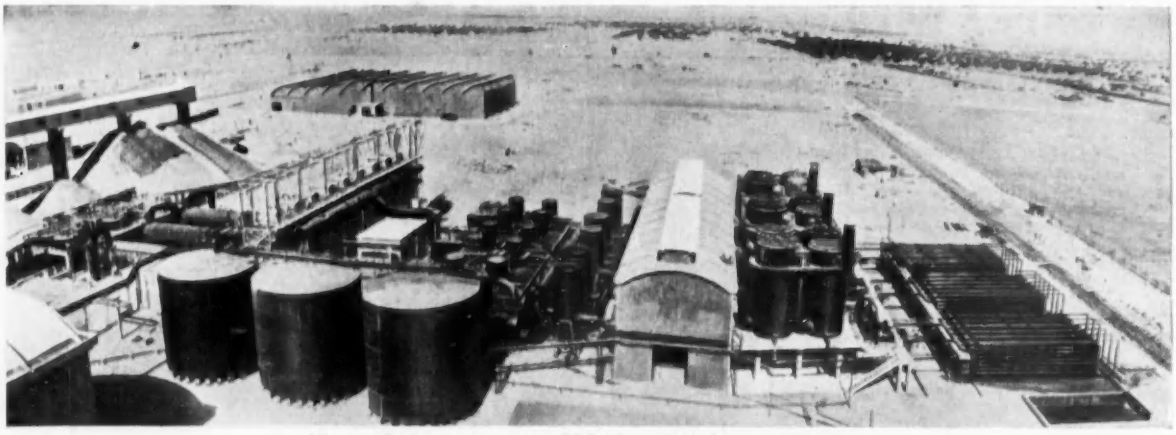

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1 DECEMBER 1956

The international weekly chemical journal covering every aspect of industrial chemistry and chemical engineering

THE CHEMICAL AGE

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VIEWPOINT

European Chemical Trends

IN THE US after his European tour, Dr. Walter J. Murphy, director of the American Chemical Society's applied journals, recently stated his views on European chemical industry (*Chem. & Engng. News*, 1956, **34**, 43).

Dr. Murphy wondered whether a united Western Europe, including Britain, could become a reality in the foreseeable future and how significant this could be for European chemical industry.

Of interest is his remark that the US had probably failed to realise the growth and size of the petrochemical industries in Great Britain, France, Germany and Italy. He pointed out that because of lack of timber, Britain and Western Europe now required more plastics and resins for constructional purposes. This was a good enough reason for the importance of the chemical industry. UK chemical exports were up by 15 per cent, Germany's had increased similarly. Both rates thus exceeded the average of 10 per cent for the US chemical industry. In other Western European countries chemical production and sales were booming. Progress in British chemical industry had been marked, and in Germany it had been striking, declared Dr. Murphy.

On the subject of research he said that despite obvious shortages of scientists and technologists the standing of fundamental and applied research was high. Many new chemical processes and products had been discovered in Britain and Western Europe, and more were in the offing. However, the scientific and technical manpower problem was critical. Opinions expressed in Britain substantiated the view that the country was 10 years' late in taking adequate steps to increase the number of scientists and chemical engineers under training. Western Germany was known to be short of engineers and this shortage would increase as industrial expansion continued.

Because the US could not ignore progress in fundamental and applied research, Dr. Murphy said he believed that more and more US chemical companies would, through varying corporate devices, establish companies and production facilities in Britain and Western Europe.

He also declared: 'The chemical industries of Britain and Western Europe are in a sound condition, are aggressive and determined to expand.'

Dr. Murphy's views deserve careful consideration. For instance, the question of a united Western Europe; during recent weeks there has been much discussion on free trade, although the matter has been overshadowed by the Suez crisis. However, the oil situation has caused OEEC to set up a special oil group with the participation of the big international oil companies, to organise supplies for Western Europe and possibly to administer an allocation scheme for petroleum products.

There is no doubt, too, that the oil situation has proved the wisdom of Britain's atomic power programme. It has shown how necessary are the atomic power stations now planned.

Chemical and allied industries require power and raw materials from oil and coal. The present situation shows that in recent years consumption of oil has increased as a fuel and a source of raw material for chemical industry. It has brought home very forcibly the fact that present known world petroleum reserves (at the current rate of consumption) may last 25 years but not more than 50.

A recently published OEEC report indicates that consumption in 1960 will increase more than 50 per cent over the 1955 figure and it is estimated that between 1960 and 1975 it may well double. Fortunately there are great reserves of coal, but the quality has fallen in recent years; it is more difficult to mine and labour is hard to find.

Britain's fundamental and applied research, as well as development in the chemical and chemical engineering fields, are highly rated. But what of the future? Doubts and concern have been expressed by eminent scientists here regarding future research and development, available facilities and the adequate training of scientific and technical personnel. Throughout the world today there is a serious shortage of scientific manpower.

Of great significance, therefore, is Dr. Murphy's remark about more US chemical and allied companies setting up organisations in Britain and Western Europe.

US companies are certain to gain from these procedures, if only by obtaining trained personnel (through payment of higher salaries than other companies in the country), who at a later stage may be persuaded to work for the head companies in the US. By such means the US may gain extra carefully chosen qualified personnel at the expense of Britain and Western Europe.

Scientific and technological education should therefore be regarded as a vital safeguard to future chemical research and development in this country. The financial status of scientists and technologists, too, should be constantly reviewed, to forestall scientific manpower losses.

People in the NEWS

● Student Problem Contest Awards for 1956 have been announced by the American Institute of Chemical Engineers, with first prize going to MR. DON CIANCI of Montreal, Quebec. Other winners are: MR. MAURICE G. LORENZ, Lafayette, Ind., second prize, and MR. DAVID KEARNS, Berkeley, Cal., third prize. The awards will be made at the 49th annual meeting of the A.I.Ch.E., at Boston, 9-12 December.

● New president of the Incorporated Sales Managers Association is the EARL OF WOOLTON. He succeeds LORD LUKE who has held office for four years. MR. ESMOND C. LEE is the new chairman of the Association.

● Two University of Wisconsin scientists, PROFESSORS KENNETH B. RAPER and EUGENE E. VAN TAMELEN have been awarded George I. Haight Travelling Research Fellowships. Professor Raper will conduct research in three laboratories in Paris, Holland and Britain, spending a two-month period at each. He will visit many laboratories in Europe. Professor Van Tamelen will conduct his research and studies at Cambridge. His work will take five months.

● Among the newly-elected associates of the Textile Institute, entitled to the description of Chartered Textile Technologist, is MR. MICHAEL JOHN BRIGGS, assistant technical officer, ICI Ltd., Fibres Division, Harrogate.

● MR. L. SCHEPERS, a managing director of the Royal Dutch/Shell group of companies recently visited the works of Petrochemicals Ltd. at Partington, Lancashire. He saw the wide range of products which are being manufactured there and visited the research laboratories and pilot plant where experimental work is being carried out on a number of new processes, including the production of low pressure polythenes. Mr. Schepers was accompanied by MR. L. H. WILLIAMS, managing director, Shell Chemical Co. Ltd.; MR. LE Q. HERBERT, managing director, Shell Refining & Marketing Co. Ltd.; and MR. F. BRAYBROOK, director and general manager, Petrochemicals Ltd., which is a wholly-owned subsidiary of the Shell Chemical Co. Ltd.

● This year's Horner's Award first prize (50 guineas) will go to MR. E. J. ARUNDELL (24) of Liverpool, whose entry was a design for a portable TV cabinet, to be carried out in phenolic and polystyrene materials. Other winners are: Second prize (25 guineas) MR. BRIAN SMITH (E. K. Cole Ltd.); third prize (10 guineas) MR. K. BRAIN (Bakelite Ltd.); highly commended, MR. W. D. HARBOUR (Westcliff-on-Sea); MR. J. M. BRENNAN (Royal Scottish Museum). The award is made at the discretion of the council of the British Plastics Federation.

● The Power-Gas Corp. Ltd, Stockton-on-Tees, has announced the appointment of two divisional directors who will be responsible for the development of the company's trade within special fields. MR. P. M. K. EMBLING was appointed manager of the chemical plant division of Power-Gas in 1955 and he now becomes divisional director responsible for that division. MR. D. R. BROWN became manager of the blast furnace division of Ashmore, Benson, Pease & Co. in 1955 and as divisional director he is now responsible for the promotion and development of blast furnace and ancillary plant.

● MR. BASIL D. THORNLEY, managing director of Benger Laboratories Ltd., announced in London on 22 November, the 'Benger Prizes for Original Observations in General Practice.' Mr. Thornley joined Benger Laboratories Ltd. in 1933 as research chemist. He was elected to the board in 1941, appointed joint managing director in 1945 and managing director in 1947.

P. M. K. Embling *B. D. Thornley*

Polycarbonates

PRODUCTION and properties of aromatic polyesters of carbonic acid are reported by Dr. H. Schnell (*Angewandte Chemie* 1956, **68**, 633, supplement to No. 20, October). These polyesters can be obtained from readily available 4,4'-dihydroxy-diphenyl-alkanes by reaction with phosgene or by interchange of ester radicals with carbonic acid diesters. Physical and chemical examination suggests that these polycarbonates have valuable properties, which open up important new fields of application for this class of plastics.

Butadiene Plant

ICI's butadiene extraction plant at Wilton works, Yorkshire (illustrated in THE CHEMICAL AGE of 13 October) has now been completed and successfully operated.

According to a statement in THE CHEMICAL AGE of 22 September, initial manufacture will be of the order of 10,000 tons a year. The main outlet for the product is in the range of synthetics known as Butakon which have uses as shoe soling compositions and oil-resistant synthetic rubbers.

Work of engineering design at the new plant was carried out by Head Wrightson Processes Ltd., London EC1, in collaboration with the licensors of the process (Phillips Petroleum Co. of the US) and with ICI staff who also undertook the site erection.

US Sulphur

PRODUCTION of US native sulphur (mined and recovered) in the first half of 1956 was 3.34 million long tons representing the highest annual rate of this decade. Exports in the six months at 753,000 tons compare with 1.6 million tons in 1955 and 1.7 million tons in 1954. However, since Mexican exports have increased to an annual rate of over 0.3 million tons so far this year, US producers are now facing significant competition in export markets.

WILL

MR. PHILIP WALTER MARSHALL, of 50 Grove Avenue, Moseley, Birmingham, a former director of ICI Paints Ltd., who died on 9 July last, at the age of 94, left £128,557 19s 9d gross, £127,416 6s 4d net (duty paid £62,491).

NOTE & COMMENT

CHEMICAL EXPORTS & OIL

THAT LENGTHY period between realisation of *facts* about our oil supplies and the introduction of compulsory rationing on 17 December may yet prove regrettable, though for administrative reasons it may be understandable. The position of the chemical industry seems particularly dangerous. Some recent comments in *The Economist* are much to the point. Germany's chemical exports are now running neck and neck with ours after a useful post-war period of British lead. But much of our post-war expansion has been in the field of petroleum chemicals—'British expansion has been built around oil, as a convenient raw material, whereas the German factories turn out the same and similar materials from natural gas, coke oven gas and acetylene. . . .'

In his first attempt to assess the economic effects of the Middle East crisis, Mr. Macmillan offered the consoling thought about exports that our competitors in Western Europe were facing the same difficulties. Somewhat obviously, in this most important sector of exports—chemicals—our main competitor is *not* facing similar raw material problems. For Germany it is an occurrence that could not come at a better time, and for us one that could hardly have come at a worse time. In a situation of balance it takes very little to tip the scales considerably.

There is a remedy, and it is simple enough. However short our oil supplies may become, priority should be given for supplies used in making chemicals from oil. No matter what resentment it may cause to other consumers, this use of oil must not be restricted. Overseas customers who are lost temporarily may be difficult to get back again. The jolt to one of our major post-war export developments cannot be risked. Is this problem sufficiently appreciated by the Government and is it being given sufficient thought? Events so far make us doubtful.

THE BRITISH COUNCIL

MANY PEOPLE look upon the British Council as a national luxury, and from time to time trenchant criticisms of its activities are made. That there were mistakes in the early post-war years would not be denied by any sensible enthusiast associated with this body, but what comparatively new organisation has ever avoided a few mistakes? The noisiest critics invariably forget the record of achievements. The Council's report for 1955-56 puts all these matters into balanced perspective. Whether it will be studied both by over-fervent supporters and over-hostile critics remains to be seen, but it costs only 1s (from The British Council, 65 Davies St., London, W1) which seems a small price for a lot of common sense.

More than half the literate world uses English as a language for international communication. About half the world's reports on scientific research are published in English. Should we merely continue to take this for granted, a token of British influence that has 'happened' and will therefore endure? Spreading the use of English as a world language is one of the Council's most important duties. This is certainly no moment in history when its activities should be reduced in the name of economy. The Council plays a large part in looking after overseas students who come here, and in providing teachers of English in foreign countries. Nothing could be more basic, less describable as a luxury.

CRITICISM OF THE ARTS

A COMMON topic of criticism is that the Council spends money lavishly upon the arts. Taking Morris dances to Fiji is the type of comment that is sweepingly advanced at home! In fact, rather less than three per cent of the Council's income from grants is devoted to 'the arts.' As the new chairman (Sir David Kelly) rightly comments, the sums spent upon aiding arts projects likely to advance British influence is minute when compared with the £2,000 per minute that some commercial firms have spent on television space.

Highest priority is given by the Council to the work of keeping overseas and home scientists in touch with each other. Indeed, this report could well have presented a fuller account of the Council's scientific activities, but greater space has been given to its basic task of spreading the use of English as a language. This, perhaps, is so fundamental to the cause of our influence in world science that we too readily disregard it. The total budget of the British Council is of the order of £3 million and not quite all of this is based upon Parliamentary grants—some £400,000 is revenue. Who can call this waste—or needless extravagance?

Index Available

THE index to Volume LXXIV (January to June, 1956) of THE CHEMICAL AGE has now been published. A limited number of copies are available to readers, who are asked to write to the Editor at Bouverie House, 154 Fleet Street, London EC4, stating their requirements. In accordance with the usual custom the index is supplied to readers without charge.

Chemical Arts Assembly

Speaker Discusses French Chemical Industry

SPEAKING of the place and rôle of the chemical industry in French economy at the Assembly of Chemical Arts 1956, Paris, 18 November to 3 December, Mons. F. Dumont, president of the Assembly of Presidents of Chambers of Commerce of the French Union, said that chemical industry was a very good example of technical progress and expansion. It had shown extraordinary development because of its importance in maintaining economic strength in France.

Chemical industry furnished many new materials, it provided maximum utilisation of natural resources and it was an essential factor in progress. It had considerable importance in French economy now and, without doubt, this would increase in the years to come.

As a measure of its importance the president quoted some figures. French chemical industry, he reported, employed 210,000 persons. The basic mineral and organic industries alone took 95,000 workers, 25,000 other employees and 10,000 organisers. It was only right to add to these figures the considerable number of users of raw materials, or of more elaborate products, which required special handling.

Outlets Developing

The outlets of the chemical industry continued to develop and techniques were being perfected all the time owing to the increasing number of scientific centres and research laboratories set up.

Mons. Dumont referred to the Chambers of Commerce and Economic Regions which were watching the progress of chemical industries which, as in all economic sectors, were represented in consular companies and thus gave an account of themselves, their needs and their intentions.

The Assembly of Presidents of Chambers of Commerce had realised that decentralisation of industry had become indispensable. The rôle of chemical industry in this decentralisation would be of the first order, not only because the industry is called upon to produce new enterprises, but because of the increased value in those regions where there has been a marked lack of speed in exploiting the rich natural resources.

The chemical industries will therefore contribute by their development in adjusting the national economic equilibrium. In this task, professional groups and chiefs of establishments could be assured of the co-operation of consular companies.

Patent Infringement

CHAS. PFIZER & CO. Inc., has asked the Havana Civil Court to issue an injunction to prohibit unlicensed sale and distribution of tetracycline (tetracyn) by Ganfersa SA, drug distributor in Cuba for Lepetit, S.p.A., Milan, Italy, which, Pfizer claims, has been manufacturing the antibiotic. Infringement of Cuban Product Patent 15168, issued to Pfizer, is charged.

Pfizer has two Cuban patents on tetracycline. One contains process claims covering production of the drug by direct fermentation. Patent 15168 contains product claims covering the manufacture, use or sale of tetracycline, regardless of the method of production or type of formulation. The US Patent Office granted basic product patent 2,699,054 to Pfizer on 11 January 1955. Pfizer has obtained to date about 90 patents in 40 countries throughout the world relating to this antibiotic and methods for its manufacture.

Scientific Translations

SPECIAL Libraries Association of New York has announced that a grant of $20,350 has been received from the National Science Foundation. The grant provides for the support of a scientific translations centre at the John Crerar Library in Chicago.

Translation Monthly, a subscription journal listing translations received by the scientific translations centre, will be expanded to include translations from the Russian. Items listed will be available for borrowing or photocopies may be obtained from the science translations centre, the John Crerar Library, 86 East Randolph Street, Chicago 1, Ill.

Exhibition Luncheon

BEFORE the opening of the ninth technical exhibition of the Oil and Colour Chemists Association at the RHS New Hall, London SW1, on 12 March next, there will be a luncheon at the Criterion, Piccadilly, London W1. Principal guest will be Lord Heyworth, chairman of Unilever Ltd. Chairman of the Association's London section (Mr. H. A. Newnham) will also speak.

Evode's New Office

EVODE LTD. has moved its headquarters to a new two-storey office and laboratory block at a nine and a half acre site at Common Road, Stafford. Telephone number is Stafford 2241. The move does not affect the London sales office, which is at 1 Victoria Street, London SW1.

Plant Protection

Wide Range of Finnish Chemicals

IN 1955, 18 Finnish companies were manufacturing and importing plant protection chemicals. It is reported that 37 different fungicides, 154 pesticides, 18 weedkillers and 13 preparations used as both fungicides and pesticides were marketed. Sales of mercuric seed dressing preparations totalled 173 tons, which is sufficient for seed dressing of almost 50 per cent of the seed used in 1955.

Pyrethrin Increase

Agricultural pesticides, contained a total of 7 tons parathion, 8 tons of DDT and 0.6 tons of lindane. Sales of arsenic and nicotine preparations, however, were decreased. Household, store-room and cowshed pesticides contained 0.6 tons parathion, 5.3 tons DDT, 2.5 tons of lindane and 0.35 tons of pyrethrin. Compared with 1954, the usage of pyrethrin increased by 200 per cent while the amount of lindane used fell by more than 50 per cent.

Dicoumarin preparations were the most widely used rodenticides, sales amounting to 23.2 tons. Sales of weedkillers increased. Thus the consumption of M-type hormone was 235 tons, EE-type hormone 27 tons, chlorinated acetic acid preparations over 50 tons and non-selective weedkillers 120 tons.

Du Pont Ulster Plant

DU PONT CO. (United Kingdom) Ltd. has taken options on a 381 acre tract near Londonderry, Northern Ireland, as the prospective site for a neoprene synthetic rubber plant. The site is located four miles north east of Londonderry and 55 miles north west of Belfast.

Lord Chandos, chairman of the Northern Ireland Development Council, commenting on the announcement, said that the Council was delighted that Du Pont had decided to press forward its plans to establish production of neoprene in the UK at a site near Londonderry as this area had one of the highest rates of male unemployment in Ulster.

Tar Distillery Fire

THREE MEN were overcome by fumes while fighting a fire which involved the pipeline of a distilling column at the Four Ashes plant of Midland Tar Distillers Ltd. on 14 November. They received hospital treatment. The fire was prevented from spreading and production was not affected.

Murgatroyd's Plant Extension

MERCURY CELLS PRODUCE CHLORINE & CAUSTIC

EXTENSION to the plant of Murgatroyd's Salt & Chemical Co. Ltd., Elworth, near Sandbach, incorporating equipment of advanced design has resulted in the company's overall production of liquid chlorine being increased to about 30,000 tons a year and that of caustic soda to approximately 35,000 tons in liquor or fused or flaked form. Salt is also produced at Elworth in large quantity (100,000 tons a year) as well as hydrochloric acid and sodium hypochlorite.

It is estimated that the extension's output is of the order of 15,000 tons of liquid chlorine and 17,000 tons of caustic soda a year.

As reported in THE CHEMICAL AGE of 24 November, Murgatroyd's is now jointly owned by DCL and Fisons and the extension is associated particularly with the provision of increased amounts of chlorine to match DCL expansions in p.v.c. manufacture and of caustic soda for Fisons' industrial and pharmaceutical interests.

Continuous Operation

The plant is in continuous operation and about 350 people are employed. The majority of the operators have been recruited locally and trained by Murgatroyd's technicians. A high standard of efficiency has been achieved and the company's chairman, Major C. J. P. Ball, said recently that the plant at Elworth is as efficient in operation as any similar unit in this country or abroad.

Murgatroyd's dates back to the 1880s when the manufacture of salt, by the open pan method, was commenced above the brine field at Middlewich, Cheshire. Various grades of open pan salt are still produced today on the same site.

Early in 1939, Murgatroyd's decided to produce salt by means of triple effect evaporators. The war postponed this development so that it was not until 1947 that plans for a new factory which would produce not only salt, but chlorine, caustic soda, hydrochloric acid and sodium hypochlorite were ready.

The site chosen is three miles south of the old factory and the brine source. It is in open country, with good transport facilities by road, rail and water.

Production commenced in 1950 and in 1953 it became apparent that with the increasing demand for chlorine, further expansion was desirable.

Hooker diaphragm cells, the first in Great Britain, had been installed initially. In the expansion it was decided to use mercury cells, of recent German design, which would provide very pure grade caustic soda. The new plant came into operation in March 1956 and projects are under consideration for further expansion.

Approximately a quarter of a million tons of brine a day are taken from the Middlewich field by pipeline to be purified by chemical treatment at Elworth. The brine is filtered and stored in header tanks, from which it is fed by gravity to the batteries of Uhde mercury cells.

In the first (electrolyser) section of each cell, electricity flows through the brine from a graphite anode to a cathode which consists of a flowing stream of mercury. Chlorine gas is liberated at the anode; sodium is liberated at the cathode, and forms a liquid amalgam with the mercury. The amalgam flows into the second (decomposer) section of the cell where it reacts with water to form hydrogen gas and a solution of sodium hydroxide. Spent brine from the electrolyser is dechlorinated, more salt is dissolved in it and the cycle of operations repeats continuously.

Chlorine Drying

Chlorine is collected, dried by means of sulphuric acid and liquefied under pressure at 5°C. Some of the hydrogen is used as a fuel gas. The sodium hydroxide solution is evaporated to yield solid caustic soda.

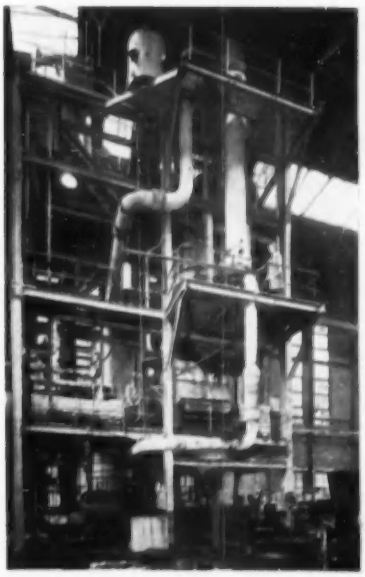
In the earlier plant the same general results were obtained by using Hooker diaphragm cells, but for the present extensions mercury cells were chosen because: (1) The mercury cell produces caustic soda of a higher quality than does the diaphragm cell. (2) In working up the caustic soda liquor from the existing diaphragm cells, a grade of salt is obtained which contains small amounts of caustic soda and is therefore unsuitable for foodstuff use. It can, however, be used as a raw material for the mercury cells.

Salt is stored in bunkers, from which it is discharged by grab and conveyor belts into three concrete-lined tanks, where it meets a rising flow of the weak brine recovered from the mercury cells.

The resaturated brine is treated with metered amounts of barium chloride, sodium hydroxide and sodium carbonate (in two mechanically-stirred rubber-lined tanks) to remove sulphates, magnesium and calcium, and weaker brine is added to adjust the strength of the solution. The liquid passes in succession through three reaction tanks in which, assisted by compressed air agitation, precipitation of the impurities is completed.

It is then forced through three rubber-lined pressure filters from which the pure, very clear brine runs to a header tank and thence by gravity to the mercury cells. Overall rate of

Climbing-film evaporator in which pure and almost anhydrous solid caustic soda is produced



Plant Extension

flow is controlled by maintaining a constant pressure at the header, and each cell is fed through an accurately sized orifice.

A two-storey building contains the mercury cells arranged in batteries on the two main floors, with the liquor and gas manifolds on an intermediate floor.

Each cell, 40 ft. long, consists of two rigid mild steel rectangular troughs mounted side by side to form the electrolyser and decomposer sections. The cells are rubber lined and mounted on concrete pillars supported on adjustable porcelain insulators. The top of each trough is machined flat and is closed by a flat rubber-lined cover plate, through which passes the copper bus-bar feeding direct current to the anodes. These anodes are drilled and grooved graphite plates suspended by insulated graphite rods, adjustable so that they can be positioned accurately.

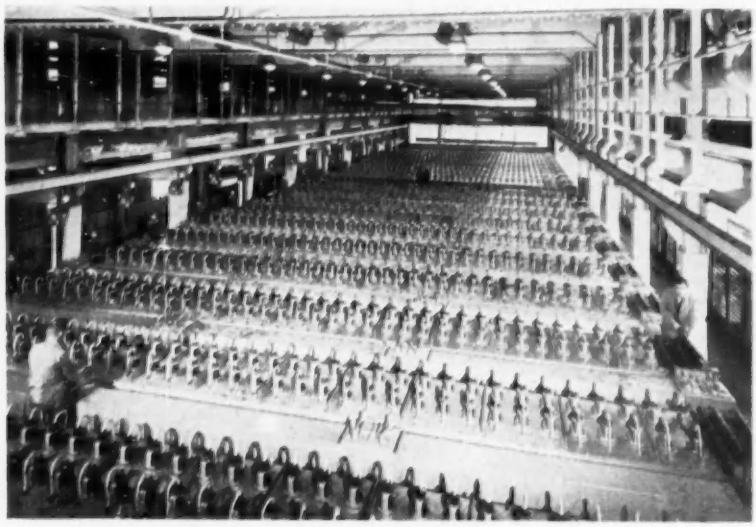
Mercury Pumps

The floor of the cell has a slight slope on which a thin layer of mercury forms the cathode. In operation the resulting sodium amalgam is separated from the weakened brine by weirs at the end of the electrolyser section and is transferred to the decomposer. A vertical pump returns the mercury to the electrolyser when the amalgam has been decomposed.

Gas liberated at the anode of the electrolyser section is chlorine of not less than 98 per cent purity. It is drawn off through ports at the end remote from the mercury pump, and passes into the chlorine manifold system. The weakened brine, saturated with chlorine, is drawn off at the same end as the chlorine and flows to the dechlorination plant housed beneath the cells.

In the decomposer section, two sets of graphite grids form short-circuited cells in which the controlled supply of soft water reacts with the sodium amalgam, producing hydrogen gas and caustic soda solution. These leave the cell through a mild steel riser and a mild steel downflow respectively, at the end next to the mercury pump. Control of the water supply is effected by a rotary distributor made of rigid p.v.c. Rate of flow of the water governs the strength of the resulting caustic soda solution.

Operation of the cells is controlled from a centralised panel. Checks are made on chlorine concentration, on sodium content of the amalgam, and on the composition of the residual gas. If the chlorine concentration is below the 98 per cent limit, hydrogen content is also determined and the cell concerned is, if necessary, shut down for examination.



Mercury cell room at Murgatroyd's Salt and Chemical Co.'s Elworth plant. The cells, of recent German design, provide very pure grade caustic soda.

For this purpose and for regular cleaning and replacement of graphite electrodes, a short-circuiting system is installed which enables any cell to be by-passed without affecting the rest. A signal bob shows when each mercury pump is functioning properly. If the pump fails, the cell is automatically switched out of circuit and an alarm bell rings.

Weakened brine, saturated with chlorine, runs from the cells to a preliminary separation tank in which gaseous chlorine is evolved; it then flows through a series of four rubber-lined steel tanks, meeting a rising stream of air bubbles blown up through porous slabs in the bottom. The air passing out of the top of the tanks contains about one per cent chlorine which is recovered by absorption in milk of lime. The degassed brine is pumped back for resaturation with salt before re-entering the cycle.

Cooling Plant

Hot moist chlorine coming from the cells is at about 80°C and is brought down to about 20°C by indirect water cooling. It is then dried by passing through a series of towers in which it meets a countercurrent stream of sulphuric acid. Catchpot separators remove any spray, and the cool dry gas is drawn off by fans and compressed and liquefied, or converted into hydrochloric acid and sodium hypochlorite.

Hexachloroethane, chloroform and other organic impurities are removed by scrubbing the gas with liquid chlorine in mild-steel purification towers, from which it passes to the first and second stage compressor units. The gas then enters a set of six vertical shell and tube coolers using calcium chloride solution at 5°C and with automatic control of the liquefaction pressure.

From the base of the liquefiers the liquid chlorine is passed through weigh tanks to storage. This consists of three tanks sited below the liquefiers and two tanks outside the building. From storage, the liquid chlorine is transferred by compressed air to the filling bay where cylinders, drums and road and rail tankers are handled.

Caustic Soda

Caustic soda from the cells passes through rubber-lined manifolds and intermediate collecting tanks to a battery of rubber-sprayed storage tanks.

Pure and almost anhydrous solid caustic soda is produced by taking a 50 per cent solution from storage, preheating it by superheated steam and then removing the water in a climbing-film evaporator operating under a vacuum. From the top of the evaporator the anhydrous molten caustic is passed to a heated storage tank before final solidification. The whole of the preheater and evaporator plant is made from solid nickel; the storage tank is of nickel-lined steel.

Modifications have also been made to the earlier plant. The output of the Hooker diaphragm cells has been increased by approximately one-third by the installation of mercury arc rectifiers. Existing caustic liquor evaporator capacity has been in-

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Staatsmijnen Programme

Production Will Remain Steady For Two Years

COAL PRODUCTION for the four mines at Staatsmijnen reached 7,477,000 tons in 1955, which represents 43 per cent of the total coal consumption of the Low Countries. It is understood that production will not be increased this year or in 1957 but will remain at seven and a half million tons per year.

Two coking plants have been set up by Staatsmijnen, to improve the value of bituminous coal extracted in the transformation into hard coke having a high content of light products.

These two coking plants produced 2.5 million tons of coke and 300 million cubic metres of gas in 1955. It is estimated that in 1956, Staatsmijnen will produce 2.7 million tons of coke and in 1957, 2.8 million tons. Gas production will be increased, according to estimates, to 350 million cubic metres in 1956 and to 380 million cubic metres in 1957.

Nitrogen Production

With regard to nitrogen production Staatsmijnen is extending its installations, in order to raise production to about 165,000 tons in 1956 and 185,000 tons in 1957. Part of this supplementary production will be used to increase the output of nitrogen chemical fertilisers, which totalled 700,000 tons last year and should reach 830,000 tons in 1957. Some will be used in the manufacture of urea which Staatsmijnen has just begun. It is estimated that production capacity will be about 50,000 tons a year. The urea will be used in the production of fertilisers and allied products, of glues and plastics materials.

Among the diverse organic chemical products also produced by Staatsmijnen will be an increase in the output of caprolactam, used in the manufacture of Dutch nylon, enkalon; the output of caprolactam will be 5,000 tons in 1957 although it only reached 3,000 tons in 1955 and is expected to reach a similar figure in 1956.

The company's range of manufactures, particularly nylon and polythene, will be widened in 1957.

Brotherton's New Address

BROTHERTON & CO. LTD. moved on 24 November from City Chambers, Leeds, to Brotherton House, Westgate, Leeds 1 (telephone Leeds 29321). Mail should be addressed to Brotherton & Co. Ltd., P.O. Box No. 6, Leeds 1.

DUTCH OIL-CRACKING

Manufacture of Catalysts

ONE of the oldest chemical works in Europe is Koninklijke Zwavelzuurfabrieken v/h Ketjen NV, Amsterdam, Holland. This company has been manufacturing sulphuric acid since 1835. In 1951 as licencees of the American Cyanamid Co., New York, US, makers of Aerocat, it began manufacturing m.s. fluid cracking catalyst. This product has been used since then under the name of Ketjencat in most oil refineries in Europe, Africa and Asia, which are equipped with a fluid bed catalytic cracking installation. The Dutch company can produce up to 18,000 tons per year. The Al_2O_3 content of the catalyst is from 12.5 to 14 per cent. Ketjen also produces a high alumina catalyst with an Al_2O_3 content of 25 per cent. In Europe, however, the latter product has so far been used on a small scale only.

Ketjencat is delivered to the European refineries in bulk, by means of special tank trucks and railway tank wagons. These cars are unloaded by means of compressed air, which fluidises the catalyst and presses it into the refinery storage hopper at a minimum cost of labour and practically without loss of product.

Ketjen engineers have developed a proportioning and measuring device, which enables refineries accurately to control and measure the addition of catalyst to the cracking plant. Nearly all users of Ketjencat have installed the Ketjen feeding device and the Ketjen weighing device in their plants.

A new factory was set up in 1950 to manufacture m.s. fluid hydroforming catalyst, Ketjenform, under licence from the Esso Research and Engineering Co., New York, US. This type of reforming catalyst is used in fluid hydroformers built under licence from Esso Research and Engineering Co. Ketjenform is a catalyst with molybdena as the active constituent on an alumina carrier.

The latest Ketjen product is a desulphurisation catalyst, which is marketed under the trade name of Ketjenfine. This is a cobalt-molybdenum catalyst on a carrier of alumina. Ketjenfine is supplied as pellets of $\frac{1}{8}$ or 3/16 in. The makers of Ketjenfine claim that compared on a weight basis, this product has at least 20 per cent greater activity than similar products. Excellent results have been achieved with this catalyst in the laboratories of the big oil companies both in desulphurisation and in the removal of nitrogen compounds.

For the manufacture and development of catalysts for the oil industry, Ketjen has installed special laboratories where the properties of the catalysts and their use under the service conditions prevailing at each refinery are investigated. Research and development of new catalysts is also carried out at these laboratories. Production of various types of reforming catalysts with platinum as the active constituent will probably be undertaken shortly.

Ketjen is considered to have become the most important manufacturer of special catalysts for the oil industry in Europe. Ketjen catalysts are marketed by the Nederlandsch Verkoopkantoor voor Chemische Producten NV in Amsterdam.

INDIAN SUGAR PATENT

WHILE the carbonation process of cane juice clarification produces sugar of superior grades due to effective elimination of impurities from the juice, sugar factories in India employing the sulphite process are reluctant to change over to carbonation. This is because of heavy capital investment involved in a changeover, transport difficulties, high cost of limestone and press-mud disposal problems.

The Shri Ram Institute for Industrial Research, Delhi, has worked out a process (Patent No. 51257) in which substantial improvement in clarification of juices is obtained by adding a measured quantity (usually 0.5 lb. per ton of cane) of processed bentonite suspension to sulphited juices as the juice drops from sulphitation tanks.

Advantages from the bentonite addition are stated to be: Improvement of $\frac{1}{2}$ to 1 unit in sugar colour where refractory juices are concerned; colour improvement is less in easily clarified juices. Bentonite corrects faulty clarification and maintains sugar quality. Scale trouble in juice heaters, evaporators and pans is lessened. The sugar produced has a better keeping quality and colour remains unaffected in storage. Some calcium is removed by bentonite treatment. There is slightly improved recovery due to extra purity and reduced viscosity of the massecuites. Less water is required in the centrifuges due to the 'purging' properties of the massecuites. As viscosity of syrups and massecuties is reduced, faster operation results.

Plastics Industry in South America

BRAZIL and Argentina are the only South American countries to have plastics industries at the present time, writes a correspondent. The other Latin American countries only undertake simple conversions to satisfy internal demand for plastics.

It is interesting to note that Venezuela plans to establish a chemical industry; this is necessary because of the industrial expansion in the country due to US capital and in particular to the manufacture of plastic materials such as polythene and polystyrene.

In Brazil, the plastics industry has been increasing very rapidly. The authorities are striving to suppress imports of plastics; in fact, by doubling the production capacity of the industry there would be an exportable surplus.

Capital Arrangements

Of the capital employed, 50 per cent is Brazilian and 30 per cent is US. Production actually covers about 70 per cent of the country's consumption, and is estimated at 17,500 tons.

The scale of manufacture is such as to allow principally polystyrene, p.v.c. and phenolic resins to be manufactured, as well as cellulose acetate and urea resins.

Government plans for 1956 provide for a total production of 30,000 tons, which is an increase of 145 per cent over the period 1954-56. According to estimations, consumption will be around 20,000 tons for 1956 which leaves Brazil with an exportable surplus of 10,000 tons. At the end of 1956, it is estimated that the production of plastics materials in Brazil will be following a certain pattern.

For example, polystyrene resins and polyester, production of which passed 7,500 tons in 1955 and will reach 9,800 tons in 1956-57. Principal producers will be Eskol with a capacity of 6,000 tons and Koppers with a capacity of 3,600 tons.

Vinyl resins, comprising particularly p.v.c. and polyvinyl acetate, will show much progress as production is expected to pass the 2,800 tons mark of 1955 to reach 6,360 tons in 1956-57. Geon do Brazil, also in this field, will increase its production capacity from 2,400 tons to 5,000 tons. Production of Brasiltex will increase from 300 tons to about 1,000 tons.

Phenolic resins will be developed as well, but to a lesser extent. Production of these will be 4,040 tons although at the present time it is of the order of 2,750 tons.

There are many manufacturers, the most important of which is Resinbra. This company's capacity will be increased from 1,200 tons to 1,500 tons. Other manufacturers of note include Resana (700 tons in 1956) Plastiresina (460 tons in 1956) as well as Alba and Wandal which together have a production capacity of 760 tons.

Formaldehyde urea resins and alkyd resins, of which production in 1955 reached 1,650 tons and 1,900 tons respectively, should by the end of 1956 be of the order of 3,500 tons for aminoplastic resins and 3,300 tons for alkyd resins.

Principal manufacturer of urea-formal resins is SACRA, which will triple its capacity from 1,200 tons and Aliberti and Alba which will produce 800 tons and 700 tons. As far as alkyd resins are concerned, Resana (1,200 tons) and Wandal (900 tons) provide nearly two-thirds of the total production.

Production of maleic resins will increase from 750 tons to 1,250 tons at the end of 1956. Resana is the principal producer, with an output of 500 tons as against 300 tons in 1955.

Acrylic Resins

Finally, it is estimated that production of acrylic resins will be doubled to reach 1,000 tons, from equal amounts produced by Schiling Hiller and Brasiltex, while Rhodia will increase production of cellulose acetate from 500 to 800 tons.

Brazil hopes, in time, to produce polythene. This will come from the Farbwerke Hoechst AG plant which is being installed in collaboration with the US company, W. R. Grace Co., Baltimore, US. The Ziegler process will be used to produce polythene in South America.

In Argentina the plastics industry has been hampered, until recently, by difficulties in importing basic materials. About 600 companies, employing 10,000 workpeople, are in existence. However, production capacity of the Argentinian plastics industry has not yet been developed, for only a small number of establishments produce basic materials.

Phenolic substances are the most important products of the principal manufacturers, comprising Plastiversal SAIC, San Nicolas; Industrias Quimicas, Sarandi; Plastion Bernabo SA, Buenos Aires; and Monsanto Argentina, SAIC.

Production Figures

Production in 1954 has been estimated at 1,600 tons of moulding powder and 300 tons of phenoplastic resins. According to estimates, world production was of the order of 2,400 tons in 1955. It is understood that a phenol plant installed by Compania Quimica, in collaboration with Farbenfabriken Bayer, will permit further expansion of this industry which produced 3,200 tons in 1955.

Moulding powders and urea resins have been made by Patricios SACIAF and by Monsanto Argentina SAIC. Production, which was 500 tons of moulding powder and 100 tons of resins in 1954, was only slightly overlapped in 1955; it does not seem as if there will be any important developments in this field. The plastics industry in Argentina produced alkyd resins (400 tons), maleic resins (200 tons) and melamine resins (100 tons). Monsanto Argentina SAIC, is setting up a factory for the polymerisation of styrene; this should be finished by the end of this year. Industrias Plasticas Argentina Koppers will also produce polystyrene in 1957.

Certain French (Péchiney) and British (ICI Ltd.) concerns envisage the production of p.v.c. in 1958, while projects for the production of polythenes and cellulose acetate will be studied, notably by an Italian company.

Two factories for the manufacture of polythene film are almost finished, one of which will commence production using imported materials.

DIARY DATES

MONDAY 3 DECEMBER

RIC & SCI

London: Society of Chemical Industry, 14 Belgrave Square SW1, 6.30 p.m. 'Elementary Particles of Nature' by Professor P. M. S. Blackett.

SCI (Yorkshire Section)

Huddersfield: Chemistry Lecture Theatre, Technical College, 6.30 p.m. 'Patents and the Chemical Industry' by C. G. Wickham.

CS (Cambridge Section)

Cambridge: University Chemical Laboratory, Lensfield Road, 8.30 p.m. 'Acetylene and cycloButadiene Complexes of the Transition Metals' by Dr. M. C. Whiting.

TUESDAY 4 DECEMBER

I.Chem.E. (London)

London: Geological Society, Burlington House, Piccadilly W1, 5.30 p.m. 'High Intensity Combustion in Chemical Engineering' by R. P. Fraser.

I.Chem.E. (NW Branch)

Chester: The Birkenhead Technical College, 7.15 p.m. 'Centrifugation as a Unit Operation' by F. A. Groves.

British Assoc. for Commercial & Industrial Education

London: Royal Festival Hall SE1, 10 a.m. One-day conference on 'Automation, Education and Training.'

Hull Chemical & Engineering Society

Hull: Church Institute, 7.30 p.m. 'Calcium Carbide Production' by J. B. Moller.

CS, RIC & SCI

Belfast: The Queen's University, 7.45 p.m. 'The Oxidation of Hydrocarbons and Aldehydes in Solution' by Professor C. E. H. Bawn.

WEDNESDAY 5 DECEMBER

CS (Irish Republic)

Dublin: Chemistry Department, University College, 7.45 p.m. 'Algal Photosynthetic Pigments by Dr. Colm O hEocha.

Society for Analytical Chemistry

London: Meeting Room of the Chemical Society, Burlington House, Piccadilly W1, 7 p.m. 'Trade Effluents': 'Introduction' by H. N. Wilson; 'The Determination of Metallic Contaminants' by N. T. Wilkinson; 'Analytical Problems Concerned with Oil and Grease in Effluents and River Waters' by J. G. Sheratt; 'Trade Effluents Analysis; the Oxygen Demand' by C. J. Regan.

CIBA Foundation

London: Large Hall, Friends House, Euston Road NW1, 5 p.m. CIBA Foundation Lecture: 'Recent Advances in the Chemistry of Natural Products' by Professor R. B. Woodward.

THURSDAY 6 DECEMBER

Royal Society

London: Burlington House W1, 4.30 p.m. The Ferrier Lecture: 'Inquiries into the Anatomical Basis of Olefactory Discrimination' by Sir Wilfrid Le Gros Clark.

RIC

London: Battersea Polytechnic, Battersea Park Road SW11, 7 p.m. 'Properties and Configuration of Large Molecules' by Dr. C. H. Bamford.

CS, RIC, SCI & Inst. of Metals

Bristol: Chemistry Department, The University, 7 p.m. 'Corrosion Fatigue' and 'Stress Corrosion' by T. D. Weaver and Dr. K. R. Wilson.

CS, RIC & SCI

Edinburgh: North British Station Hotel, 7.30 p.m. 'The Application of Disintegrators and Conveyor Heat Exchangers in the Chemical and Food Industries' by T. S. Ling.

CS (Southampton Section)

Southampton: Chemistry Department, The University, 8 p.m. 'Degradation of High Polymers' by Dr. N. Grassie.

SAC (Scottish Section)

Glasgow: Central Station Hotel, 7 p.m. The Ramsay Dinner.

SAC (Midlands Section)

Birmingham: Mason Theatre, The University, Edmund Street, 7 p.m. Discussion on 'Qualitative Inorganic Analysis' opened by H. Holness and R. Harrison.

FRIDAY 7 DECEMBER

CS, RIC & SCI

Manchester: Chemistry Lecture Theatre, The University, 6.30 p.m. 'New Aspects of the Sequestration of Metals' by Dr. R. L. Smith.

CS, RIC & SCI

Aberdeen: Marischal College, 7.30 p.m. 'Polarographic Studies in Physical and Analytical Chemistry' by Dr. W. Furness.

New Balance Design

Features One Scale Pan & No Knife Edges

AN ENTIRELY new balance featuring one scale pan is being shown by a group of French manufacturers at the IV Exhibition of Chemistry, Rubber and Plastics being held in Paris from 22 November to 3 December. The main feature of this balance is undoubtedly a revolutionary one in that there are no knife edges. These have been replaced by a bifilar (two-thread) suspension of the beam and the scale pan. This reduces the time taken up in raising and lowering the beam before each deposit or withdrawal of substance being weighed.

A second feature, which also results in reduced weighing time is the limitation of the movement of the beam thus avoiding resetting of the beam. Thirdly, it is possible to read directly on an indicator dial the weight result up to 100 grammes and in milligrammes to the tenth part of a milligramme on a graduated scale.

October Chemical Exports

AN INCREASE of nearly £5 million over the previous month was recorded for October's chemical exports. The figures are £22,813,645 compared with £17,937,879 for September. A comparison with the figures for October 1955 shows an increase of £2,062,839.

India and Australia were still our biggest customers at £1,633,157 and £1,470,228, no other country coming above the £1 million mark.

A short breakdown of the export figures for various chemicals follows:

Basic chemical elements & compounds	£5,559,318
Coal tar products	£396,144
Synthetic dyestuffs	£879,280
Paints, pigments & tannins	£2,220,724
Medicinal & pharmaceutical products	£3,280,893
Essential oils, perfumes, soaps, polishes, etc.	£2,806,945
Fertilisers	£96,130
Plastics	£2,561,661

SCI (Fine Chemicals Group)

London: Chemistry Lecture Theatre, King's College, Strand WC2, 7 p.m. 'Newer Applications of Fine Chemicals in the Rubber Industry' by A. E. T. Neale.

Institute of Metal Finishing

London: Waldorf Hotel, Aldwych WC2, 7 for 7.30 p.m. Annual Dinner and Dance.

SATURDAY 8 DECEMBER

Liverpool: City Laboratories, Mount Pleasant, 2.15 p.m. 'Some Applications of the Weisz Ring-Oven' by Dr. W. I. Stephen.

Plant Extension

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creased, mainly by raising the pass-out steam pressure.

General handling facilities, extensions to the refrigeration plant, new laboratories and new stores have also been provided.

A considerable supply of direct current has always been needed for the electrolytic processes, and process steam and cooling water are also required in large amounts. In the original plant, a reasonable balance was achieved between steam required for processing and for power generation but, as a result of the extensions, electrical loading has increased proportionately more than the demand for process steam. The extra electric power needed is obtained from the Grid via a 33,000-volt substation. The power is transformed to 11,000 volts and fed to the d.c. rectifiers and to a transformer substation which distribute low-voltage power to the plant.

Most Modern Type

To feed the mercury cells the most modern type of mechanical contact rectifier is used. Supplied through the English Electric Co. Ltd., the installation includes contact rectifiers manufactured by Siemens-Schuckertwerke AG, and is claimed to be the largest of its type in existence, and 97 per cent efficient. It is in a separate room adjacent to the banks of cells, and is entirely automatic in operation. The room is pressurised to prevent polluted air entering the equipment.

Brown-Boveri mercury arc rectifiers are used to augment the Hooker cell supply, and work in parallel with the plant power house generators.

Effluent is dealt with in a plant of interesting design before passing out to the nearby Trent and Mersey canal.

Health Precautions

Precautions are taken to avoid the potential health hazard presented by the considerable amount of mercury continuously in circulation. Water seal-pots are provided wherever mercury vapour might possibly leak into the air. All floor drains in the cell building have at least two sumps to trap effectively any spilled mercury. Operators must change underclothing before entering the cell house. They wear protective clothing when on duty there, and take shower baths immediately on going off duty. All operators are medically examined at regular intervals.

The cell house has an open slatted wall on one side, with a slatted wooden walkway providing vertical ventilation on each side of the rows of cells; a full-length ridge ventilator extracts air from the top of the building. Checks on the mercury content of the air form a routine precaution.

Main chemical engineering contractors for the expansion programme were W. J. Fraser & Co. Ltd. The mercury cell installation and new brine treatment plant were designed and, in the main, supplied by Friedrich Uhde GmbH, Dortmund.

Mechanical contact rectifiers and the ancillary installations were designed and supplied by the English Electric Co. Ltd., incorporating Siemens-Schuckertwerke rectifiers. Bus-bar installation was carried out by Thomas Bolton & Sons Ltd. The rectifier cooling-air system was supplied by Heenan & Froude Ltd.

High-voltage switchgear was supplied and erected by Metropolitan-Vickers Electrical Co. Ltd. Low-voltage distribution and switchgear was installed by W. H. Smith & Co. (Electrical Engineers) Ltd. The climbing-film evaporator for anhydrous caustic soda was designed by Walter L. Badger.

The plant in the new extension has been designed so that additional units can be installed with a minimum of interference with production. Murgatroyd's technicians, assisted by DCL engineers, were responsible for co-ordinating the expansion programme.

Restrictive Trading

REGISTRATION of restrictive trading agreements begins on 30 November. During the three month period (ending on 28 February next) particulars of any restrictive trading agreements must be sent to the Registrar of Restrictive Trading Agreements for inclusion in the register which will, in due course, be available for inspection.

Particulars required by the Registrar have been laid down in regulations which he has made. All parties to a registrable agreement are under an obligation to furnish such particulars.

Office of the Registrar is at Chancery House, Chancery Lane, London WC2, and 9 Wemyss Place, Edinburgh 3. In Northern Ireland the Keeper of the register of trading agreement is at the Ministry of Commerce, Chichester House, Belfast.

New Home for I.Chem.E.

THE Institution of Chemical Engineers moved from Victoria Street on 26 November to 16 Belgrave Square, London SW1 (telephone: BELgravia 3647; telegrams: Inchemengs, Knights, London).

US Chemical Engineering

Report Surveys Education & Development

JUST PUBLISHED by HMSO for DSIR price 2s 0d (36 cents US) by post 2s 2d is a report on 'Chemical Enginering in the USA'. It is one of a series of surveys on scientific and technical subjects which is being made under the guidance of the scientific attaché in Washington. The present publication was prepared by Dr. P. H. Calderbank, a member of the staff of the Chemical Research Laboratory and is based on visits to educational centres and industrial establishments, and on conversations with many representatives of those concerned with the selection, training and employment of chemical engineers in the US. The development of US chemical engineering, the present position in chemical engineering education, and the way in which chemical engineering practice has developed are all reviewed.

Teaching Methods

Methods of teaching chemical engineering science are of interest. Under one scheme—the 'practice school' method—groups of university students work in industrial plant with their instructor on special problems of interest to the host company. Another method of training, 'plant design', requires students to co-operate with each other and their instructor in designing full scale chemical plant for various purposes. There are also 'sandwich courses' similar to those in this country.

There is now an increasing emphasis on teaching students fundamental principles of 'Engineering Science', according to this report. The courses contain no technology but concentrate on physics, chemistry and mathematics. It is hoped in this way to train graduates who will fit in to any of the established branches of engineering. The student who wishes to train as a specialist can do so either by post-graduate research and advanced study or by gaining practical experience of specialised subjects in industry itself.

SAC Discussion

A DISCUSSION on 'Qualitative Inorganic Analysis' will be opened by Mr. H. Holness, M.Sc., F.R.I.C., and Mr. R. Harrison, M.A., B.Sc., F.R.I.C., at a meeting of the Midlands Section of the Society for Analytical Chemistry on Thursday 6 December at 7 p.m. in the Mason Theatre, The University, Edmund Street, Birmingham 3.

VACUUM METALLURGY

Pumps Play Important Part in Recent Progress

VACUUM METALLURGY has made great progress particularly during the past few years, mainly due to the powerful vacuum pumps available nowadays. A new pump for vacuum metallurgy is the Heraeus High Vacuum Roots Pump.* It is a purely mechanical pump without any valves.

The pump is provided with two figure eight shaped rotors which counter-rotate and which are synchronized by a pair of gear wheels. There is no friction between the rotors as such nor between the rotors and the pump body. By accurate shaping of these rotors sufficiently close tolerances are obtained to provide the narrow slots which are essential for low back-streaming rates. Particularly in the fine vacuum range the flow impedance of these slots is high enough to be considered as a dynamic seal. Roots pumps are claimed to be robust and to need neglible maintenance. As the pump cylinder needs no lubrication these purely mechanical pumps may be classified ' oil free.'

Special features of these pumps are the smallest overall dimensions for high pumping speed; an oil-free pump cylinder, thus insensitive to dust; and very little wear.

Broad-Spead Optimum

High vacuum pumping units have been developed which provide in the pressure range of steel casting—between 100 microns and a few millimeters of mercury—a broad-spread optimum of capacity (largest model 15,000 c.f.m.).

Pumping units are tailor-made for each particular application. The Roots standard range of basic pumps is suitable, however, for most units. Every unit consists of a number of single or multi-stage Roots pumps and a water-ring pump for backing. The actual lay-out is imposed by the working pressure range. Special care has been taken to prevent water and water vapours from penetrating the vacuum chamber. Water-ring pumps are markedly pollution-resistant, contrary to the conventional oil-sealed rotary pumps which quickly clog and show signs of wear. An efficient degassing of vacuum cast steel guarantees enhanced properties and in particular avoids the formation of hydrogen flakes.

The required pumping speeds are illustrated in the following example: Assuming an average gas content of 200 STP litres per ton and an average pouring speed of 5 tons per minute, a pressure of 3.8 mm.Hg is to be held during pouring. This calls for a vacuum pump of 7,000 c.f.m. pumping speed at the prevailing pressure. A lower working pressure requires a correspondingly increased suction speed. From this numerical example it follows that the capacity of the pump is limited only by the gas content, the pouring rate and the pre-determined working pressure. It is independent of the amount of metal to be treated.

High Throughput

Quite often it is desired to pump a vacuum chamber of up to 30,000 cubic feet volume down to the working pressure within a few minutes. This means that a high throughput must be provided not only during the actual degassing, but readily from atmospheric pressure. The use of fluid gear boxes guarantees an optimum of drive power efficiency, and an automatic adaptation of the pump revolutions to the pressure fluctuations.

A grit separator is provided on the fine side of the Roots pumps. Coarser particles are collected there, whereas fine dust goes right through the Roots pump and is flushed away in the water-ring pump.

Some smaller pump sets of similar design are the VP-RG 3010 units and VP-RG 6020 units of 1,800 and 3,600 c.f.m. suction speed respectively.

For working pressures in the lower micron range, and for high vacuum, Roots pumps with built-in motors have proved satisfactory. They are of very much reduced overall dimensions and run very smoothly. Power consumption has been reduced to the minimum. As no shaft seals are used these pumps can be permanently operated at high revolution speeds. This series of pumps covers the range from 85 c.f.m. up to 3,600 c.f.m.

* Sole UK distributors are Fleischmann (London) Ltd., 16 Northumberland Avenue, London WC2.

CIBA Lecture Change

OWING TO an unexpectedly heavy demand for tickets, the eighth Ciba Foundation lecture to be given by Professor R. B. Woodward, professor of chemistry, Harvard University, on 'Recent Advances in the Chemistry of Natural Products' at 5 p.m. on 5 December (see THE CHEMICAL AGE, 17 November, 284) will now be held in the Large Hall, Friends House, Euston Road, London NW1.

Glass Technology

Scholarship Offered at Sheffield University

STUDENTS about to leave school, who have been studying chemistry and physics, may apply for scholarships in glass technology at the University of Sheffield. The Worshipful Company of Glass Sellers of London offers up to four scholarships which, in suitable circumstances, qualify for supplementation by the Ministry of Education up to the full value of State Scholarships. The scholarship examination consists of papers in chemistry, physics and pure mathematics (two as primary subjects and one as a secondary subject) together with an English language paper.

Applications for entry should be made to the University by 1 February 1957 accompanied by an entry form. Entry forms, syllabuses, and further particulars may be obtained from The Registrar, University of Sheffield, Sheffield 10. The examination will begin at the University on 1 April 1957.

Presidential Meeting

PRESIDENTS of four chemical societies will meet in Glasgow for the annual Ramsay chemical dinner on 6 December. Dr. K. A. Williams, president of the Society for Analytical Chemistry, who will reply to the toast 'Our Guests', will be accompanied by Dr. D. W. Kent-Jones, president of the Royal Institute of Chemistry, Professor Hirst, president of the Chemical Society, and Mr. Julian Leonard, president of the SCI.

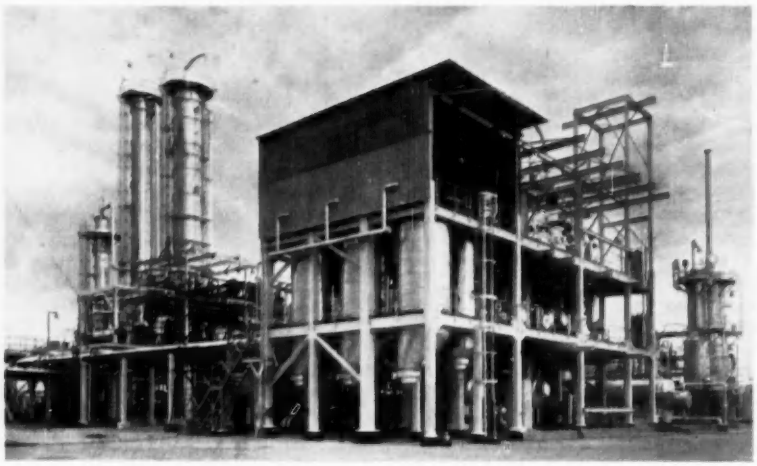
Main toast of the evening will be 'The Profession of Chemistry', proposed by Lord Cameron. Dr. James Craik, chairman of Nobel Division, ICI Ltd., will propose the toast 'Our Guests'.

Nuclear Equipment Orders

ORDERS for equipment associated with industrial applications of atomic energy have been encouraging says the chairman's report of the Heenen Group. Profits rose from £499,485 to £505,900 last year. The board proposes to make a one-for-one scrip issue, but warns shareholders that this does not imply an increase in the effective rate of dividend.

Naphthalene Plant

PLANS have been approved for extending the naphthalene plant building at the Clarence distillation works, Billingham, for Dorman Long (Chemicals) Ltd.



SHELL ALKYLATE PLANT

Pure Raw Material for Detergent Industry

PRODUCTION at the Shell Haven detergent alkylate plant of Shell Chemical Co., which began in August of this year, is now well under way. The plant manufactures dodecylbenzene, an important raw material for the powder synthetic detergent industry.

In the Shell plant benzene is reacted with tetrapropylene in the presence of an acidic catalyst. The two materials are vigorously mixed with the catalyst, careful control being maintained of the reaction conditions such as temperature, residence time, ratio of benzene to olefin and amount of catalyst.

Partial Purification

Crude dodecylbenzene is produced which is partially purified by allowing the catalyst to settle out. The catalyst is recycled to the reactor. The remainder of the catalyst, plus unchanged benzene are removed by passing the product through towers containing activated alumina followed by caustic.

Final purification is then carried out by distillation. Low boiling point impurities are removed in a vacuum column. Dodecylbenzene is then taken as an overhead product from an atmospheric pressure column.

The catalyst is maintained at high purity in a regeneration column. When asked about the nature of the catalyst a representative of the company would only say that it was a volatile acid.

Plant heating is by a hot oil circulation system which is maintained from one central heater.

Operation of the plant is fully automatic and control is carried out from a central panel which records the state of every part of the plant, e.g., reaction temperature, throughput, quantity of feedstock. Any fault in the system is immediately recorded and visible and audible warning is given. If for any reason an operative is splashed with acid, the action of standing under one of the showers which are placed at appropriate parts of the plant will start the shower and operate a warning.

The plant is divided into four sections: (1) The tank farm, (2) the pump house, (3) the reaction centre, and (4) the distillation section. Next to sections 3 and 4 are placed the central control room, the offices and a small laboratory. Total surface area occupied by the plant is about eight acres.

Foster Wheeler Ltd., of London, were the main contractors for the plant, and the instrumentation was by Foxboro-Yoxall, Ltd., George Kent Ltd., and Rotatherm.

The design of the plant was by the BPM (Royal Dutch/Shell Group) and was based on experience gained in the Shell installations in the Netherlands.

Whiter Than Water

Shell claims that its product is the most pure available, being 'whiter than water' when first produced. Annual production capacity is estimated at 30,000 tons at present, but in the opinion of the plant manager this could probably be stepped up to 40,000 tons if necessary. At present he said they were running at somewhat less than 30,000 tons on the average. He was confident that with the development of further markets for detergent they would have no difficulty eventually in selling all they could produce.

It was in 1937 that Shell entered the synthetic detergent industry with the decision to build an alkyl sulphate plant at Stanlow in Cheshire. World War II delayed progress and it was not until 1942, when the fats and oils shortage was becoming acute, that Government approval was obtained for the completion of the plant and production started in the spring of that year.

The introduction on a large scale of synthetic domestic detergent powders by the leading soap companies created an unprecedented demand for alkyl benzene and, as a result, Shell opened a plant at Curacao in 1949.

Alkyl benzene is still the principal raw material for synthetic detergents, although the chemical structure has changed somewhat in the light of experience. Shell now claims to supply nearly two thirds of the synthetic detergents used by industry for process use, and over half the raw material used by the makers of domestic detergent powders.

The picture at the top of the page shows the acid catalyst unit, with driers and treaters in foreground, of the detergent alkylate plant.

Refinery Output Cut

AT THE END of last week British refineries began operating on substantially reduced throughputs of crude oil. A 25 per cent cut has been made at the three main refineries of British Petroleum and the throughputs of Esso Petroleum's Fawley refinery and the Coryton refinery of Mobil Oil have been reduced. Shell Petroleum's refineries are also reported to be running at below capacity.

The decision to make further reduction in refinery throughput will, it is understood, depend on what additional supplies of oil from the Western Hemisphere can be obtained and on what proportion of petroleum products is involved in these purchases.

Some refineries are reported to be already reducing catalytic cracking processes to save gas, diesel oils and fuel oil, which are needed for industry.

Nobel Wins ICI Trophy

THE Inter-Division Safety Trophy of Imperial Chemical Industries Ltd. was presented by the chairman, Sir Alexander Fleck, to Dr. James Craik, who accepted on behalf of Nobel Division, at Blackpool on 16 November.

From the start of July 1955 until the end of June 1956, Nobel Division with a frequency rate of 0.707 showed a 39.6 per cent improvement over its previous best figure and won the trophy. This is the first time Nobel Division has succeeded in doing so.

OIL & COLOUR CHEMISTS' DISCUSSION

Vapour Phase Chromatography

AT THE MEETING of the London section of the Oil and Colour Chemists Association on Thursday 15 November, Dr. F. W. Hobden, of Imperial Chemical Industries Ltd., paints division, lectured on 'Vapour Phase Chromatography'.

Dr. Hobden talked entirely about gas-liquid partition chromatography. He said it was by far the most versatile method and was a very powerful means of separating a wide range of compounds.

He discussed factors affecting the retention times of the apparatus, illustrated the design of a conventional apparatus and described some of the applications which had been found useful.

A graph was shown to indicate the power of this method to separate materials, and also its sensitivity; and he went on to discuss the theory and the working of the process.

There was, he said, a fairly general relationship between retention volume and the temperature of column operation. If one were faced with the problem of separating two materials having similar retention times, one stood a better chance of doing so by operating the column at low temperature rather than high temperature.

Retention Time or Volume

The retention time or retention volume was dependent on the nature of the vapour, the nature of the stationary phase and the temperature of operation of the column. Superimposed on those three basic parameters there was a number of others for which corrections had to be made.

Having made those corrections there were two possibilities. One of them, which was simple but was quite adequate for most work, consisted in expressing all retention times or retention volumes relative to some standard material. The second method was rather more complicated.

Coming to the method of carrying out qualitative analysis, he said it was based simply on a comparision of retention times of the components in a mixture with the retention times of known compounds. Quantitative analysis depended on the measurement of the peak height. That height was related to the amount of material present, and was also dependent on the amount of material injected. It was normal practice to add a known amount of some standard and refer all the heights to it; then one could prepare a calibration curve of concentration against rate of peak height. One could usually achieve accuracy of plus or minus three per cent.

In the next part of the lecture Dr. Hobden illustrated and described the apparatus used and the requirements of its components.

Then he came to the applications of vapour phase chromatography. Quite obviously a very useful field was that of solvent analysis. There seemed to be a good case, he said, for replacing the normal or conventional methods of testing solvents, as carried out by such means as distillation ranges, aromatic content, and so on by a straightforward chromatographic analysis. He felt that much of the time spent in the works laboratory of a large undertaking on testing solvents could be saved by the use of such techniques.

Typical Works Problem

Next he discussed a typical works problem. A resin solution produced in the normal course of manufacture seemed to differ from the previous one. The laboratory was asked to find out whether it had been contaminated en route. It was about a 60 per cent alkyd resin solution, and they had just put it into a dinonyl phthalate column; within three hours they had obtained two chromatograms, and comparison of the two showed that nothing strange had got into the solution.

Limit of Volatility

When asked what was the lower limit of volatility that could be used in the apparatus, Dr. Hobden said that he and his colleagues had put through the column such things as methyl stearate. Other people had put through even higher methyl esters, he believed up to C_{22}; they had done a lot of work on fatty acids, such things as xylols, in columns to operate at up to 300°C. If there was a reasonable vapour pressure one stood a good chance.

Then he was asked if he had had experience of a column containing two different liquid phases, running from one column to the other in the hope of holding something in the first column and passing it to the second column so that the retention volume was not too far behind the other. Dr. Hobden said the only use made of that was where a glycerol column was used to hold back the water; by holding back the glycerol column one could hold back the water for a considerable time—in one case five hours.

Asked about the types of indicators that were used, he said the most common one was the thermal conductivity cell; the other two main ones were the gas sensitivity balance and the flame detector.

In reply to a further question he said that thermistors had been used in place of thermal conductivity cells by some workers.

Anti-Dumping Bill

Government Measure Introduced in Commons

THE Government's Customs Duties (Dumping and Subsidies) Bill was published on 23 November.

The Government considers that, in order to assist in the maintenance of international fair trade practices, there should be powers in the UK to take action against dumping and the giving of subsidies on goods imported into this country.

The present Bill will accordingly give the Board of Trade power to impose additional customs duties on imports of goods of any description, where it is satisfied that those goods have been dumped or subsidised and that it is in the national interest to do so. The power to impose these duties will be exercised by Order, subject to affirmative resolution in the House of Commons.

There are provisions in the Bill for giving relief from duty, and for the allowance of drawback of duty on goods subsequently exported, in appropriate cases.

The Government will exercise the powers in this Bill in accordance with its international obligations.

Monopolies Commission

THE BOARD OF TRADE has appointed the following part-time members of the Monopolies Commission for the periods shown:

Professor G. C. Allen (1 November 1956 to 23 November 1961); Sir Thomas Barnes, G.C.B., C.B.E. (1 November 1956 to 22 November 1959); Mr. J. A. Birch (1 November 1956 to 22 November 1959); Mr. Brian Davidson (1 November 1956 to 19 January 1960); Dr. L. T. M. Gray (15 November 1956 to 14 November 1960); Mr. I. C. Hill (1 November 1956 to 16 October 1957); and Sir Frank Shires (13 November 1956 to 12 November 1959). Apart from Dr. Gray and Sir Frank Shires, the part-time members were all members of the former Monopolies and Restrictive Practices Commission.

An inquiry into chemical fertilisers, which was begun in 1955, is being made by the Commission.

From all Quarters

Upjohn Subsidiary

A WHOLLY OWNED subsidiary has been established in Australia by The Upjohn Company, of the US.

The firm, The Upjohn Company (Aust.) Pty. Ltd., is now occupying temporary quarters in Sydney. An 11-acre building site has been purchased in Parramatta, a suburb of Sydney, and plans are being drawn for the construction of a plant there. It is expected that the site will be ready for occupation by 1 January next.

New Synthetic Fibre

FIRST SYNTHETIC FIBRE to be developed in Sweden is Tacryl, which is related to Orlon and Terylene. It has been developed by the Swedish Superphosphate Co. who have been working on the fibre for seven years. A completely new spinning process has been invented for it. Further experiments will be carried out before the Swedish textile industry takes up its manufacture.

Niobium Source Found

SOURCES of pyrochlore, the mineral in which niobium is usually found, have been discovered in the Feira district of the Central Province of Northern Rhodesia. Niobium is a highly prized strategical metal and sells at more than £1,000 a ton.

Maiden Voyage Completed

THE WORLD'S largest tanker, the *Universe Leader*, arrived in San Francisco last month completing her maiden voyage from Sumatra with a cargo of 26 million gallons of oil. The tanker carries her cargo in 52 separate tanks below deck. With a weight of over 79,000 tons of oil on board, she has a displacemnet of 109,000 tons. Her speed is 15 knots.

Norwegian Oil Refinery

NORWEGIAN government departments are reported to be studying proposals by Standard Oil of New Jersey for building an oil refinery in Norway. The proposals submitted by Standard Oil envisage a refinery with a capacity of about two million tons raw oil a year. Costing almost £11 million, the plant would employ between 300 and 400 workers. It would probably be erected on the east side of the Oslo fjord. Most of the output would be distributed in Norway through Norsk Esso A/S, and any surplus would be marketed in Denmark and Sweden.

French Oil Situation

REPORTS suggest that some French industries are already affected by lack of fuel oil. A number of glassworks are said to have closed and some chemical plants have had to reduce their activities by 20 per cent or more.

£12m. Expansion Programme

A RECENT ANNOUNCEMENT by Rhenanian Olefine Works, jointly owned by Shell and Badische Anilin, states that a £12 million expansion programme is planned to raise the output of polythene from 10,000 tons a year to 30,000 tons by 1958.

Norway's Oil Consumption up

NORWAY'S oil and petrol consumption has increased 600 per cent in the last 10 years, according to a survey published by the Norwegian insurance company Storebrand. In the same period, consumption in the world as a whole has increased by only 300 per cent.

NZ Oil Supplies

THE results of a diversion of tankers round the Cape could have only an indirect effect on supplies of oil for New Zealand. This was stated recently by Mr. E. H. Halstead, Minister of Industries and Commerce. Substantial stocks of all oil products were held in New Zealand.

Turkish Chemical Imports

AN ALLOCATION of $10,000 for the importation of chemical products into Turkey has been announced by the Istanbul Chamber of Commerce.

Fuel in Rhodesia

PRESENT holding of petroleum fuels in the Rhodesias is said to be about 28 days, according to an official statement on 12 November. Fears had been expressed that with tankers going round the Cape to Britain and Europe the Federation of Rhodesia and Nysaland might find its fuel supply curtailed. Maximum effort is being made to move fuels from Beira and Lourenco Marques to the Federation.

Zirconium Process Sold

WORLD patent rights in a new process for the extraction of zirconium have been sold to the US National Distillers Corporation by the Australian Government. Zirconium is found in the black sub-soil of beach sands in many areas of the eastern and northern coasts of Australia. NDC is said to be the largest supplier of zirconium to the USAEC. The Commission's requirements of the metal during the next five years are believed to be of the order of 11 million pounds by weight.

Heavy Water Project

NEW ZEALAND spent £579,949 on Geothermal Development Ltd., the company in which NZ and the UK were partners until the UK withdrew this year. The company was established to produce heavy water as a by-product of New Zealand's project for generating electricity by geothermal steam in the North Island. Some of the total expenditure will be recovered from UKAEA, it is reported.

Chlorine/caustic soda plants

SIX 15,000 amp de Nova mercury cells, type 9DGL, made by Oronzio de Nova, Milan, are being supplied to Establicimiento Electroquimico Electron, Uruguay. Oronzio de Nova is supplying eleven 25,000 amp de Nova mercury cells type 16DGL, also for the electrolytic production of chlorine and caustic soda to Fabrika Celuloze Banga Luka, Yugoslavia. The number of Nova cells operated will later be increased to fourteen.

by
Peter Cooper F.P.S.

Toxic Hazards in Industry

PART III—LOCAL EFFECTS OF SOLVENTS

THE SKIN comprises an outer epidermis of keratinised epithelial cells overlying an inner dermis richly supplied with blood-vessels and nerve-endings. The epidermis, whose function is protective, is covered with the secretion of the sebaceous glands, consisting of cholesterol and waxes and, except after long immersion, is water-proof. Any agent which is able to dissolve this oily protective layer of the skin renders the sensitive dermis liable to chemical attack and bacterial invasion, particularly if it also causes cracking of the horny layer which serves as an additional defence.

First noticeable effects of an organic solvent or a powerful detergent are dryness, scaliness and loss of the normal elasticity of the skin. Any fat-solvent produces this condition, but in particular isoamyl acetate, benzene, carbon tetrachloride, chloroform, ethanol, ether, ethyl acetate, methanol, toluene, trichloroethylene, turpentine oil and xylene. Methanol and turpentine can cause a subsequent contact dermatitis. Chloroform may sometimes be absorbed percutaneously in sufficient quantity to cause a toxic dermatitis of systemic and not local origin.

Resistance of Oily Skins

As a general rule, however, solvents merely pave the way for other chemicals, whether ionised or not, which would under normal skin conditions be unable to penetrate to the dermal cells. It is not surprising that workers who have habitually oily skins show a greater resistance to skin irritants than those with dry skins.

Effect on Nervous System

Once the solvent has penetrated to the living cells, it has two main modes of attack. It may dissolve the lipoid constituents of the cell, and continue to act in this way upon other cells until it has been removed from the site of action by the bloodstream. Or it may denature the protein constituents and form a coagulum of impermeable material which sets a natural barrier to further penetration. Some compounds (such as chloroform) carry on both methods of attack simultaneously. The alcohols tend to be cell-precipitants, whereas the chlorinated hydrocarbons, hydrocarbons, ethers and ketones are predominantly lipoid solvents. As these compounds are also lipo-soluble, they exert a narcotic effect upon the nervous system. Thus, the handling of them may lead, after percutaneous absorption, to neurotoxic reactions.

Most of the systemic absorption of a solvent from the skin surface takes place by way of the hair follicles and the sweat ducts. Some basic substances (such as pyridine) are particularly potent in this respect since they are able to dissolve the keratin layer itself.

When a solvent eventually reaches the dermal cells, it sets up irritation there. The first reaction of the body is to increase the blood supply to the threatened area, so that redness (erythema) develops. Simple erythema is associated with benzene, chloroform and turpentine in small amounts. Usually the irritation of local nerve-endings causes itching and burning at the same time. Carbon disulphide may cause severe pain on contact.

Swelling and Blisters

After irritation has reached a certain pitch, the increased permeability of the capillary walls leads to the leaking of serum into the surrounding tissues, causing swelling of the affected part. If the exudate becomes too great to be carried away by the lymph channels, it forms visible accumulations as vesicles of fluid, which often coalesce into a blister. Vesication may follow contact with carbon disulphide, chloroform or trichloroethylene.

Purpura, a condition where blood from a damaged capillary network accumulates locally in the tissues, indicates a greater degree of skin damage. Discrete patches are called petechiae, larger confluent areas ecchymoses. Purpura usually indicates direct vascular injury by the solvent, but it may occasionally be indirect evidence of liver intoxication by chronic absorption. It is sometimes associated with benzene, carbon tetrachloride, pyridine and tetrachloroethane, or with chronic exposure to carbon disulphide. Benzene has been known to exert so toxic an effect as to bring about progressive degeneration of the blood supply to an area, with consequent gangrene.

Solvent vapours exert a toxic effect upon the comparatively vulnerable mucous membrane of the body cavities, particularly the conjunctiva and respiratory mucosa. Mucosal epithelium has no impermeable layer to protect the underlying tissue, and on chemical irritation it reacts by secreting large volumes of mucus.

Headache from Vapour

Some vapours (such as benzene) can directly cause bleeding of the nose, and most solvents cause dryness and irritation of nose and throat, or even persistent cough, if inhaled for long periods. Frontal headache may result from the irritation of the epithelium of the nasal sinuses; here the acetates, benzene, isopropyl alcohol and tetralin have been incriminated.

Serious injury to the nasal nerve-endings may bring

Toxic Hazards in Industry

about the loss of the sense of smell (anosmia), a condition caused by acetic acid vapour. Vapours which irritate the nose also bring about conjuntivitis and perhaps spasm of the eye-lids. Butanol produces a burning sensation in the eyes, with photophobia and even turbidity of the cornea. Methanol has similar effects. Respiratory irritants follow a descending course, from nose and larynx to the bronchial tree, where the reflex secretion of the epithelium may lead to accumulation of fluid and finally pneumonia. Cough is the warning that this process has been initiated.

Protective Devices

Direct contact of liquid solvents with the skin must be avoided mainly by using protective garments. Barrier creams may be used as a second line of defence, but those against solvents are far less effective than waterproof creams. It is extremely difficult to devise a barrier, other than a fabric, which will offer more than a mild protection against acetone, for example.

Products containing bentonite, zinc oxide, titanium dioxide or talc may be used to block the skin follicles and retard penetration. Alternatively, the follicles may be filled with soap, by inunction of a stearic acid vanishing cream (stearic acid 20, sodium carbonate 2, glycerin 6 and water 100). A mucilage, provided it is well distributed and allowed to dry thoroughly before handling the solvent, offers protection (acacia 5, tragacanth 5, borax 2 and water to 100).

Barrier Substances Formula

The Barrier Substances Sub-Committee of the British Pharmaceutical Codex has published (1954) a provisional formula (C) containing sterile kaolin 20, bentonite 3, hard soap 12, glycerin 6, stearic acid 2, sodium chloride 1, chlorocresol 0.2, phenol 0.5, and water to 100. To restore elasticity and oiliness to defatted skin, the application of woolfat, either alone or mixed with a vegetable oil or soft paraffin, is excellent and is both emollient and soothing.

Protection against solvent vapours is largely a problem of good ventilation. Unnecessarily high working temperatures increase the exposure and should be avoided. Once contamination has occurred, fresh air and the avoidance of solvent vapours for some time are necessary precautions. Eye-irritation due to vapour should be treated by copious washing with water or saline and the subsequent application of an emollient cream. Precautions must be taken to avoid bacterial invasion of the affected tissue.

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NYLON FILTER CLOTHS

Uses Described in Booklet

ADVANTAGES of nylon filter cloths and a description of some of the many purposes for which they are being used are discussed in a leaflet issued by British Nylon Spinners Ltd.

Use of nylon filter cloths in Britain is said to be extensive and their long life more than offsets any greater initial cost. In addition they frequently help to improve production efficiency, according to the leaflet.

Nylon's strength and toughness are fundamental advantages. Others vary from one process to another and include such things as easier cake removal and cloth cleaning, immunity to rotting, a higher rate of filtration, resistance to chemical attack (particularly by alkalis) and absence of loose fibres (with continuous filament cloths), and resistance to shrinkage and blinding.

Nylon is used on rotary vacuum filters and on presses.

Coke Oven Construction

IN 1908, Simon-Carves Ltd., Cheadle Heath, Stockport, Lancashire, built the first coke ovens in India. In fact most of the coke oven plants now operating in India have been built by this company and most of the gas and metallurgical coke used by the Indian iron and steel industry is produced by these plants.

Post-war work by Simon-Carves Ltd. covers the construction or reconstruction of 692 ovens. At present over three million tons of coal a year are carbonised in existing Simon-Carves ovens and completion of contracts now in hand will increase this quantity to nearly seven million tons a year.

The company has recently published a booklet giving details of Simon-Carves coke ovens and steelworks plant in India and of its service and organisation there.

Nuclear Development

NEW edition of the Central Office of Information reference pamphlet *The Commonwealth and Nuclear Development* includes a description of the agricultural applications of radio-isotopes—for example, in assessing the value of soil fertilisers and in preventing potatoes from sprouting too quickly. A summary of the Medical Research Committee's report on the effects of nuclear radiation is included in the section on safety and health. Prospects for British firms in exporting research reactors and nucleonic instruments as well as nuclear power stations are mentioned. Over 250 British firms are currently engaged in the atomic energy industry. Other additions are a complete list of all the nuclear reactors at present working, being built or planned in the United Kingdom; a glossary of technical terms for the non-scientific reader; and an enlarged bibliography which should prove of value to the librarian and research worker. This pamphlet can be obtained from HM Stationery Office, price 3s 6d.

Chemist's Bookshelf

POLYESTERS & THEIR APPLICATIONS. J. BJORKSTEN, H. TOVEY, B. HARKER & J. HENNING. Reinhold Publishing Corp., NY; Chapman & Hall Ltd., London. *1956*. Pp. 618. *80s*.

This volume has been prepared by members of the Bjorksten Research Laboratories Inc., and is probably the first comprehensive volume to cover the entire field of polyesters from raw materials through the various chemical processes of preparation of the polymers to the final manufactured products.

After a simple introduction which covers ideas such as functionality, free radicals, number and weight average molecular weights and the simple chemistry of polyesters, the volume is divided into two major sections dealing with saturated and unsaturated polyesters respectively.

The longer and more comprehensive section, on the unsaturated esters, deals systematically with the subject. Common raw materials such as maleic and fumaric acids, phthalic anhydride, adipic and other dibasic acids are considered, followed by the vinyl monomers such as di-allyl phthalate and styrene, although the term 'cross linking agent' when applied to simple monomers such as styrene is somewhat confusing, this term in vinyl resin chemistry being normally reserved for monomers with at least two unsaturated bonds. Full details are given of typical process equipment for polyester manufacture.

Catalysis of the System

One of the key factors in the practical application of unsaturated polyesters is the catalysis of the system. This not only implies the catalyst in the sense in which the term is used in polymerisation chemistry, but also the various retardants which stabilise polyesters at room temperature, and accelerators such as metal salt driers. Full details of most of the commonly used materials are included together with some exotherm and gel time graphs. There is a minor misprint on page 52 where in equation 2a the formula for tert-butyl hydroperoxide is given as $C_4H_9.O.O.H$. instead of $C_4H_9.O.O.H$.

On the practical side chapters are devoted to fillers and reinforcements (including the properties of glass fibres), fabricating and finishing. There is a list of commercial resins available in the US. Possibly the most interesting section is entitled 'Tailor-making Polyesters' which indicates how flexibility, crystallinity and other properties vary with the chemical nature of the components. Thus bulky side chains discourage crystallinity, while the reduction of the amount of unsaturated ester reduces the chances of cross linking and will cause increased flexibility of the final product.

A sentence (p. 172) 'In order to avoid violating commercial confidences the comments made will be restricted to published information regarding inhibitors' illustrates the only weakness in this excellent volume. One feels occasionally that the amount of information known on some aspects is greater than that actually published.

About 50 pages are devoted to the chemistry of the saturated fibre-forming polyesters of which the Terylene (polyethylene glycol tere-phthalate) type is by far the most important representative. It is worth emphasising that the process producing this material is, in fact, an ester interchange between ethylene glycol and di-methyl tere-phthalate and not a simple direct esterification.

Di-isocyanate modified polyesters are as yet little known in this country, but Chemigum SL represents one of the end products of much research. It is indicated that these products are still in the experimental stage, although polyurethane foams are now an article of commerce, especially in Germany.

About 3,300 references have been compiled by the authors in a task which took many years and, except for a short supplement on more recent publications, all data as available on 1 June 1954 have been included. Nearly half of the book is devoted to a comprehensive review of the literature which is divided into a patent section, and a more general one including articles, books and manufacturers' literature. These sections are divided into the same chapters as the main volume and include a summary of each reference quoted, which adds enormously to the value of this reference section.

There are short chapters on testing, health hazards, and comprehensive indexes.

For its size, this book is not unduly expensive by present day standards. The supplements, which it is hoped to issue periodically, will be eagerly awaited, and the book is to be considered a 'must' in any technical library, or resin chemist's bookshelf. H.W.

Boiler Feedwater Control

A NEW 35 per cent hydrazine solution, Scav-Ox, for removing dissolved oxygen from boiler feedwater was introduced by Olin Mathieson Chemical Corporation earlier this year (THE CHEMICAL AGE, 14 July, 88). The company has now issued a 16-page illustrated booklet which covers in detail the use of Scav-Ox for protecting low, medium and high pressure boilers. The determination of dosage, recommended methods of application, testing methods for hydrazine and properties and handling of the material are discussed. Comprehensive operating data are presented in the form of case studies in each of the three boiler classes. The booklet is available from the Industrial Chemicals Division of Olin Mathieson Chemical Corporation, Baltimore 3, Maryland, US.

CHEMICAL STOCKS & SHARES

International Uncertainties Restrict Business

THE uncertainties of international affairs have continued to restrict business in stock markets where both British funds and industrial shares have declined further on balance, though there was some recovery from lowest levels touched during the month. War Loan 3½ per cent, for example, reached £68⅛, the lowest it has ever touched, but later there was a rally to £69⅛.

Sentiment in stock markets has naturally been affected by the fear that it may take six months or more to make the Suez Canal safe for the normal flow of shipping, and that in the meantime, bearing in mind the rise in freight rates, prices of many commodities and metals may tend to rise. It is this fear of a fresh impetus to inflation which has led to the widespread belief that the credit squeeze may remain in force well into next year.

Financial results from well-known companies, and also half-yearly statements and profit figures, have continued to show that in industry generally, rising costs are continuing to reduce profit margins. Despite the uncertain conditions in stock markets, which must be expected to remain so long as international doubts and fears are the dominating factor, some important new issues have made their appearance, and more are expected in due course. It is realised that plans for expansion and development must be carried out, because they are vital if we are to hold our own in export markets in the future.

BOC Issue

British Oxygen has made a £10,000,000 issue of 5¼ per cent debentures. There has been revived talk in stock markets that Imperial Chemical may have in mind an issue of loan stock of as much as £20 to £30 million, but this is unconfirmed.

Nevertheless, new issue talk is one reason for the sharp decline in Imperial Chemical ordinary units which, as compared with a month ago, have dropped from 41s to 38s 6d, the lowest level this year. There is, however, general confidence that the 10 per cent dividend will be easily maintained for the year, and it can be expected that the price of the units will recover strongly when general conditions in stock markets improve. Brotherton 10s shares have come back from 25s after improving to 25s 7½d. Monsanto Chemical 10s shares at 23s were within 3d of the price ruling a month ago. Glaxo 10s shares remained under the influence of the good results and chairman's annual statement, but at 33s 6d have not held best prices.

Reichhold Chemical 5s shares at 14s 3d lost 1s 6d, but Albright & Wilson 5s shares have been a firm feature, and at 18s 9d were in fact, a few pence higher than a month ago. Elsewhere, F. W. Berk 5s shares eased from 7s 6d to 7s. Hickson & Welch 10s shares at 28s 3d were virtually maintained on balance, as were Hardman & Holden 5s shares at 10s 3d. British Chrome & Chemicals at 9s 3d lost 6d on balance, but Yorkshire Dyeware & Chemical 5s shares held last month's improvement to 9s. Anchor Chemical 5s shares at 11s 6d have been steady, Ashe Chemical 1s shares were 10½d, Lawes Chemical 10s shares 15s 9d while in other directions, Laporte 5s shares at 15s 6d were within 6d of the level a month ago.

Sharp Fluctuations

There have been sharp fluctuations in the shares of Borax Holdings, which at £13¾, compared with £14½ a month ago, but there is general confidence in higher dividend prospects. Morgan Crucible 'A' shares have changed hands around 40s. Triplex Glass 10s shares remained active, but in line with the general trend in stock markets during the month, have reacted to 31s 3d compared with 33s 4½d a week ago.

The 6s 8d units of The Distillers Co. lost 1s at 19s 9d. Boots Drug 5s shares at 13s 6d were 6d higher on balance and British Drug Houses at 12s 9d were only 3d easier on balance. Staveley have changed hands around 43s 3d, Ruston & Hornsby were 27s 6d and Tube Investments became steadier at 53s 9d following the chairman's annual statement. There were again big fluctuations in British Aluminium shares, which like other shares in which American and Canadian investors have been taking an interest, tended to move with Wall Street markets. As compared with a month ago the price has come back from 68s 6d to 63s 6d.

Among plastics, British Xylonite at 24s 6d xd compared with 25s 9d a month ago, and British Industrial Plastics 2s shares were 4s 3d compared with 4s 6d. Courtaulds fell back from 34s 4½d a month ago to 30s 4½d, though there were a number of small gains in textile shares, helped by news that the conventional textiles are fighting back against the progress made by nylon, for example in the field of non-iron shirts.

Oil shares showed heavy falls, particularly BP. The City feels it is very difficult to assess to what extent the earnings of individual oil companies will be affected by the Middle East developments. Much may depend on how long the Suez Canal is shut and to what extent the US helps in supply of oil to Western Europe. BP shares were 125s compared with 147s 6d a month ago.

Technological Education

Is Government Plan Likely to be Adequate?

DR. BOWDEN, principal of the Manchester College of Science and Technology, commenting on the Government's intention to spend £70 millions in the next five years on the expansion of technical education in this country, said that it was equivalent only to 30 cigarettes a year for each man, woman and child during that time.

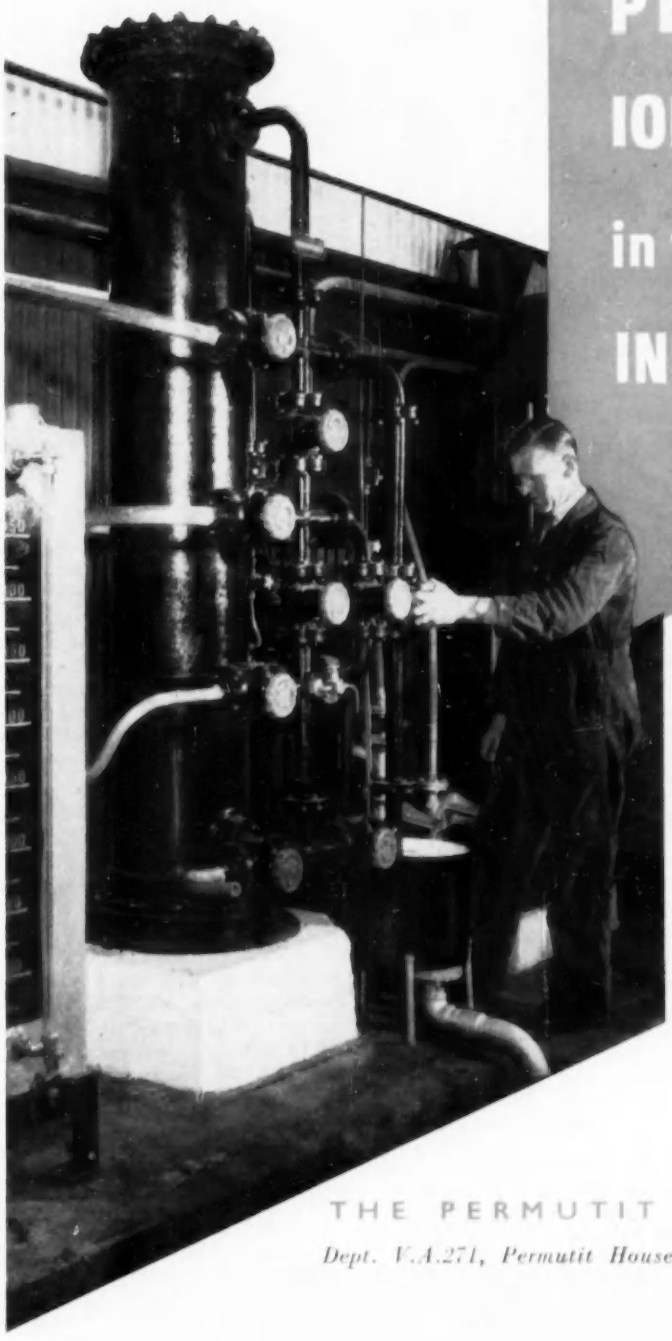
Half Century of Neglect

He queried whether it was likely to be adequate to make up for the neglect of half a century and allow us to compete with other industrial countries. Dr. Bowden was reading the 1956 Sir Alfred Herbert paper on 'The Development of Technological Education in Europe, America and England' to the Institution of Production Engineers at the College. An industry manned by graduates would, he felt, be more versatile and more receptive of new ideas than one in which most of the operatives have come up the hard way.

He said the Russians would in future be able to supply qualified technologists to all those countries in Africa, South America and Asia that were trying to develop their own industries. These men would be the missionaries of this modern age and they would have great influence.

Self-Taught Men

The industrial revolution had made this country rich and great, but it was made almost entirely by self-taught men and by private academy students. Other countries, envious of our prosperity, improved the quality of science teaching in their universities. By 1930 Germany had 26,500 full-time students in its technical colleges; in the same year the UK had 4,500 university students of technology. After the last war the shortage of technologists led the Barlow Committee to suggest that the number of graduates should be doubled, but there was still a desperate shortage of technologists and scientists, declared Dr. Bowden.



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Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages & Charges

The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.

ESSO PETROLEUM CO. LTD., London SW.—19 October, £10 million debenture stock together with premiums of up to two per cent payable in certain events secured by a Trust Deed dated 18 October 1956, supplemental to Trust Deed dated 12 March 1953; general charge. *£10 million. 30 May 1956.

REGENT OIL CO. LTD., London W.—26 October, substituted security supplemental to a bond dated 20 April 1955 & deeds supplemental thereto, to Foremen & Staff Mutual Benefit Society; charged on certain moneys. *Nil. 14 June 1956.

UNITED RUBBER MANUFACTURERS CORPORATION LTD., London SW.—30 October, charge, to District Bank Ltd. securing all moneys due or to become due to the Bank; charged on 55 Meadow Lane, Nottingham. *Nil. 16 May 1955.

Satisfaction

CENTURY GLASS WORKS LTD., London N.—Satisfaction 6 November, £2,300 (not ex.) registered 24 February 1949.

Increases of Capital

THORNTON & ROSS LTD. (185,947), manufacturing chemists, etc., Linthwaite, Huddersfield, increased by £40,000, in 30,000 ordinary and 10,000 six per cent cumulative preference shares of £1, beyond the registered capital of £45,000.

B. B. CHEMICAL CO. LTD. (68,328), Ulverscroft Road, Leicester, increased by £300,000, in £1 shares, beyond the registered capital of £600,000.

WALTER GEORGE FRENCH LTD. (457,083), processes, inventions etc., in connection with metallurgical and chemical processes, etc., Powell Duffryn House, Adelaide Street, Swansea, increased by £1,900, in £1 ordinary shares, beyond the registered capital of £100.

New Registrations

Woolset Products Ltd.

Private company (574,334). Registered 16 November. Capital £10,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in soaps, soap powders etc. The subscribers (each with one share) are: Gordon J. T. Robinson, solicitor and Ormond J. Hook, solicitor's managing clerk, both of 11 Waterloo Place, London SW1. The first directors are to be appointed by the subscribers. Solicitors: Richards Butler & Co., 11 Waterloo Place, London SW1.

Wayne Kerr Co. Ltd.

Private company (574,404). Registered 19 November. Capital £60,000 in £1 shares. Objects: To acquire the issued share capitals of Wayne Kerr Laboratories Ltd.; Wayne Kerr Engineering Co. Ltd.; and Electro Plating & Metal Finishers Ltd.; and to carry on the business of an investment trust company in all its branches etc. The directors are: Ivan C. Foxwell, 46 Upper Grosvenor Street, London W1; Richard H. C. Foxwell, The White House, Swanton, Morley, near Dereham; David L. Breeden, Raymond Calvert and Hon. Anthony T. S. Montagu; all directors of Wayne Kerr Laboratories Ltd. Solicitors: C. A. Maddin & Co., Surbiton. Registered office: Roebuck Road, Chessington, Surrey.

W. M. Hesselberger Ltd.

Private company (574,549). Registered 21 November. Capital £100 in £1 shares. Objects: To carry on the business of assayers, analysts, consultants and advisers to the metal, chemical and allied trades, etc. The directors are: Max Hesselberger and Flora Hesselberger, both of 121 Cholmley Gardens, London NW6. Secretary: Flora Hesselberger. Registered office: 26-7 Conduit Street, London W1.

MARKET REPORTS

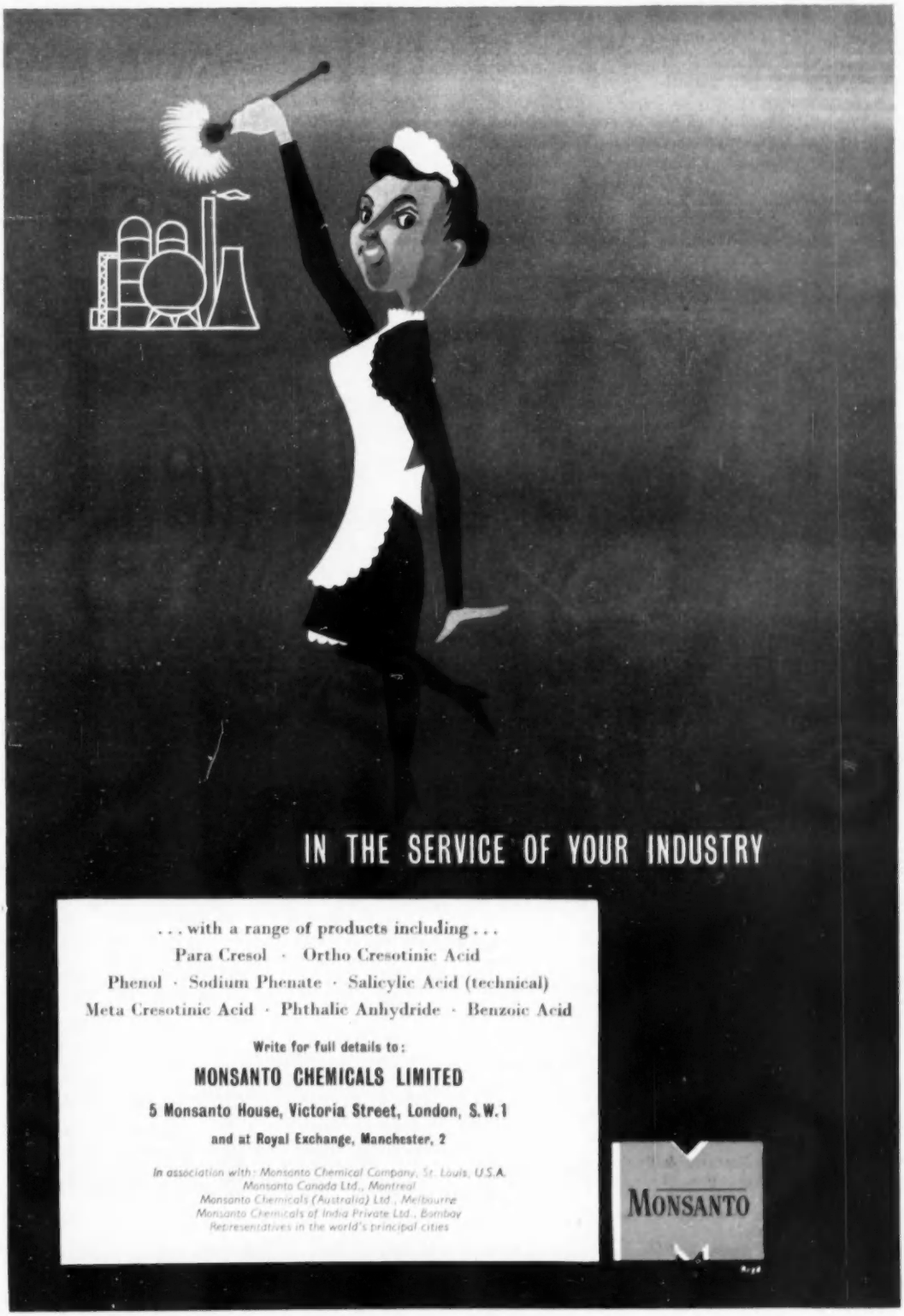
LONDON A firm undertone characterises most sections of the industrial chemicals market. While there has been little change in quotations on the week, such factors as increased freight and insurance rates must be taken into account for shipment business. With few exceptions, supplies appear to be adequate for current needs. Contract deliveries are being taken up in good quantities while there has been more interest in covering forward requirements. A good demand for hydrogen peroxide, borax and boric acid has been reported, and formaldehyde and acetone are in active request. A fair trade is passing in fertilisers. Among the coal-tar products, pitch is in good call on home and export account; buying interest is maintained for cresylic acid and creosote oil. Prices in most sections are unchanged.

MANCHESTER Traders during the past week have experienced no easing of the demand for the alkalis and other heavy products. Somewhat increased pressure for deliveries has again been reported in several quarters where the opinion has been expressed that normal year-end contraction in the pressure for supplies may be less pronounced than usual. Prices are on a firm basis and it will be surprising if, under present conditions, the 'freeze' announced some months ago by leading producers can for long be maintained.

GLASGOW Business has been very brisk during the past week in most sections of the Scottish heavy chemical market. Petrol and oil restrictions will have an effect on the transport position, and attention is being focused on the products most likely to be affected. No important price changes have taken place.

Fire Alarm Equipment

FIRE ALARM equipment, manual and electrical (closed and open circuit types), is described in a leaflet issued by Carter & Co. (Nelson) Ltd., Nelson, Lancs. Also described is an indicator to which the alarm points are coupled; this shows in which part of the premises the alarm has been 'pulled.'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PATENTS

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APPLICATIONS

C31966 Cellulose ethers thermoplastic compositions. Dow Chemical Co.
C32164 Thermoplastic compositions. Dow Chemical Co.
P32327 Organic compounds. Abbott Laboratories Ltd. and Donnison, G. H.
C32470 Acetylene alcohols. Lovens Kemiske Fabrik.
P31868 Petroleum resins producing process. Archer, D. P.
C31934 Titanium tetrachloride. Armour Research Foundation.
P32142—P32141 Fluorine compounds. Associated Fumigators Ltd.
C32052 Poly-acrylonitrile dyeing process. Badische Anilin- & Soda-Fabrik AG.
C31851 Fire-proof coating compositions. Bertrand, M. L.
C31887 Gas purifying device. Berz, M., and Berz, W.
P32107 Slags treatment. British Iron & Steel Research Association.
P32121 Melamine. British Oxygen Co. Ltd.
P31947 Porous materials washing apparatus. Bush, I. E.
C32550 Mesityl oxide. Celanese Corporation of America.
C31937 Nylon fabrics dyeing process. Chemstrand Corporation.
C32136—C32137 Synthetic tubes. Chemstrand Corporation.
C32333 Hydrocarbons sulphonation process. Continental Oil Co.
C32290 Thiophenyl pyridyl derivatives. Deutsche Gold-und Silber Scheideanstalt vorm. Roessler.
C32593 Chromium electro-deposition process. Diamond Alkali Co.
C32311 Vinyl chloride polymerisation process. Dow Chemical Co.
C32620 Catalytic dehydrogenation method. Dow Chemical Co.
P32041 Sheet rubber vulcanising method. Dunlop Rubber Co. Ltd.
P31819 Elastomer foams. Dunlop Rubber Co. Ltd.
C32065 Hydrogen fluoride slurry process. Du Pont de Nemours & Co., E. I.
C32328 Polybenzoxazoles. Du Pont de Nemours & Co., E. I.
C32329 Polybenzimidazoles. Du Pont de Nemours & Co., E. I.
C32495 Polyester fibre dyeing process. Du Pont de Nemours & Co., E. I.
C32630 Regenerated cellulose structures. Du Pont de Nemours & Co., E. I.
C32625 Vapour phase reactions. Du Pont de Nemours & Co., E. I.
C32624 Sulphuric acid esters salts. Durand & Huguenin AG.
C31869 Lubricants. Esso Research & Engineering Co.
C32125 Eta alumina preparation. Esso Research & Engineering Co.
C32401 Residual catalyst removing method. Esso Research & Engineering Co.
C31929 Alkaline earth metal hydrides purifying process. Farbenfabriken Bayer AG.
C32163 Halogen polymers. Farbwerke Hoechst AG.
C32186 Polyolefines manufacture. Farbwerke Hoechst AG.
C32563 Pyrimidine derivatives. Farmaceutici Italia SA.
C32405 Synthetic polymers. Firestone Tire & Rubber Co.
C32406 Rubbery polymer. Firestone Tire & Rubber Co.
C32407 Diolefines polymerisation process. Firestone Tire & Rubber Co.
C31841 Insecticidal compounds. Geigy AG., J. R.
C32389 Cis.-1.2-diamino cycloalkanes reaction products. Geigy AG., J. R.
P31810 Textile materials treatment process. Geigy Co. Ltd.
C32616 Tantalum recovering method. Ges. fur Elektrometallurgie and Starck AG.
C32617 Tantalum precipitant method. Ges. fur Elektrometallurgie and Starck AG.
P31870 Protein hydrolysis process. Glaser, W.
C32080 Aromatic amines. Goodrich Co., B. F.
C32536 Urethanes preparing method. Goodrich Co., B. F.
P32252 Polymers. Grady, D., and Hodge, A.
C32466 Detergent composition. Hedley & Co. Ltd., T.
C32285 Monomere glycol terephthalates. Hercules Powder Co.
C32296 Polymerisation process. Hoepli, M. H. and Perlman, R. R.
P31874 Organic compound. Imperial Chemical Industries Ltd.

ACCEPTANCES

Applications in the following list, and the specifications filed in pursuance thereof, will be open to public inspection in due course. Persons interested may give notice of opposition to the grant of a Patent on any of the applications included in the list by filing Patents Form number 12 *at any time within the prescribed period.*

765 090 Method of and apparatus for cleaning gases. CURA Patents Ltd.
764 858 Organic silicon compounds. Wacker-Chemie Ges.
765 194 Heat exchangers. Binder, H. G.
764 721 Cured polyester-urethane castings. Goodrich Co.
764 911 Filters and filtering elements. British Filters Ltd.
764 957 Quinoline derivatives. Monsanto Chemicals Ltd.
765 197 Apparatus for the combustion or gasification of liquid or liquefiable fuels. Badische Anilin- & Soda-Fabrik AG.
764 690 Sensitising dyestuffs of the merocyanine series manufacture and use. Farbwerke Hoechst AG.
764 958 Anaesthetic agents. Cassella Farbwerke Mainkur AG.
765 189 Lubricants. Chemische Werke Huls AG. [Addition 745 409].
764 961 Water resistant lubricating grease. Esso Research & Engineering Co.
764 964 Linear polyesters. British Celanese Ltd.
764 833 Treatment of glyceride oils. Clayton, B.
765 108 Manufacture of combustible gas. Humphreys & Glasgow Ltd.
764 918 Methods and apparatus for producing an emulsion. Eicken, H.
764 919 Recovery of oil from minerals. Esso Research & Engineering Co.
764 836 Production of alkali cellulose. Courtaulds Ltd.
764 710 Producing fumagillin. Abbott Laboratories.
764 715 Stabilised solutions containing streptomycin. Merck & Co. Inc.
764 891 Devices for sterilising bottles. Seitz-Werke Ges.
764 718 Freeze-drying processes. Glaxo Laboratories Ltd.
765 080 Dyeing synthetic polyamide fibres. Sandoz Ltd.
764 871 Apparatus for separating liquid or solid particles from gas. Kittel, W.
764 720 1, 4, 5, 6, 7, 7-hexachloro-2-chloromethyl-bicyclo (2.2.1)-5-heptene and process for the production thereof. Ruhrchemie AG.
765 208 Process for rendering textile materials water-repellent. Boehme Fettchemie Ges.
765 086 Anticholinergic preparation. Smith Kline & French International Co.
764 896 Distributor for liquids in packed columns. Rütgerswerke AG.
765 088 Wax composition. Farbwerke Hoechst AG.
764 932 Extreme pressure lubricant compositions etc. Standard Oil Development Co.
765 004 Conversion of hydrocarbons. Esso Research & Engineering Co.

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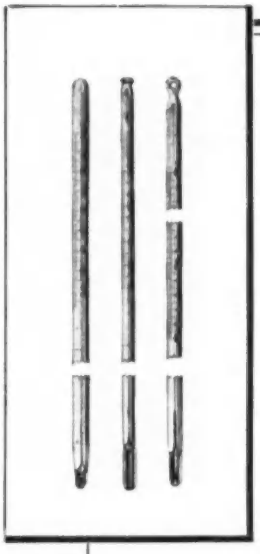

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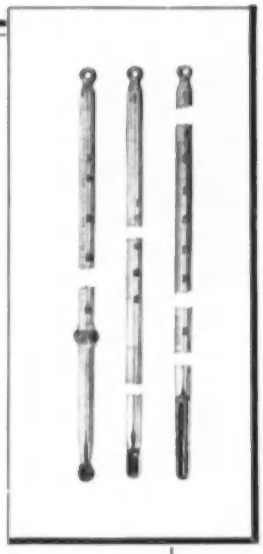

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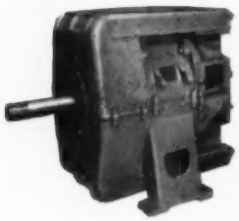

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